# Dulles Corridor Special Study
# Transportation Analysis Update and Mitigation Strategies Discussion

Presented to:
Reston Master Plan Special Study Task Force

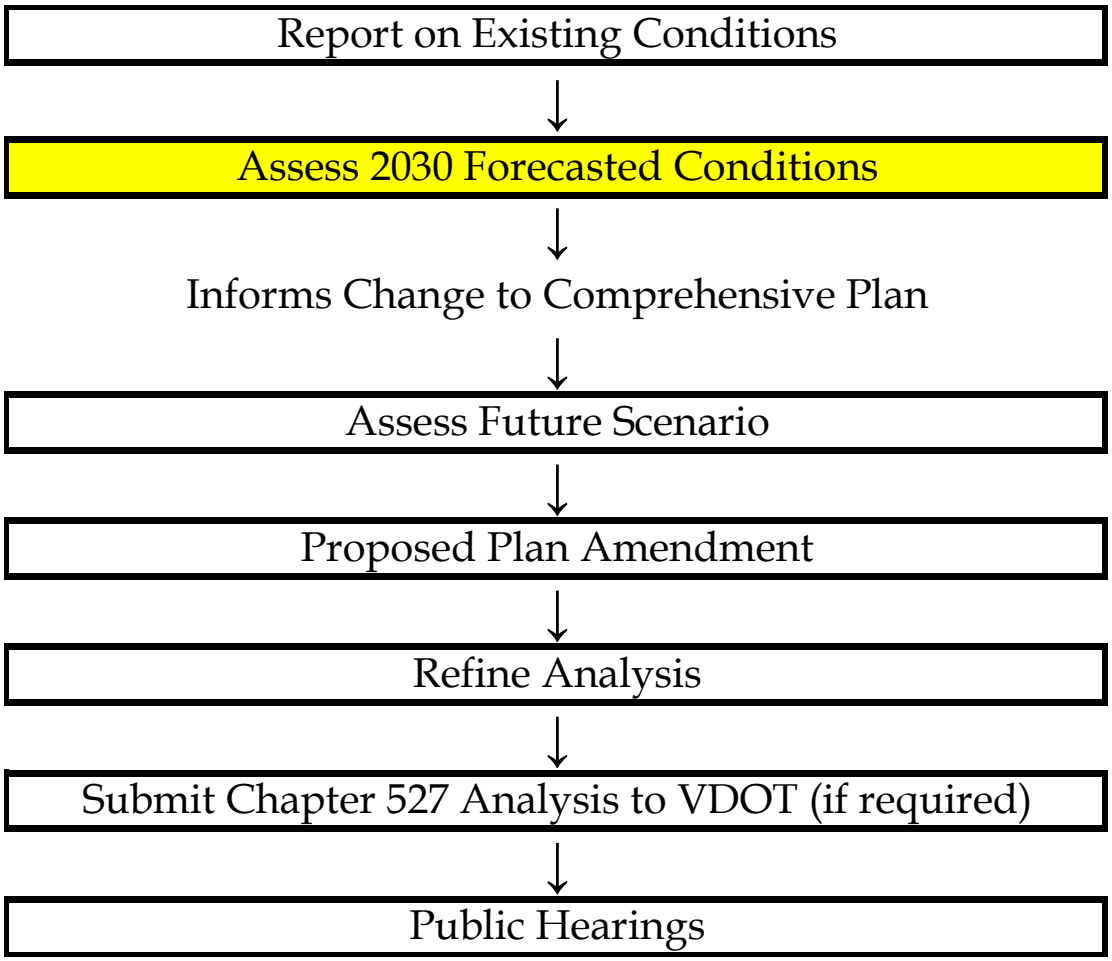
Presented by:
Fairfax County Department of Transportation/
Cambridge Systematics

July 26, 2011

# Presentation Outline

- Overview of Transportation Analysis
- Quick Recap of Prior Presentations – where we left off
- Transportation Model
  - Overview of Travel Demand Forecasting Model (4 step process)
  - Mode Choice
  - Updated Land Use Forecasts
  - Transit Service
- Mitigation Strategies
- Questions/Discussion

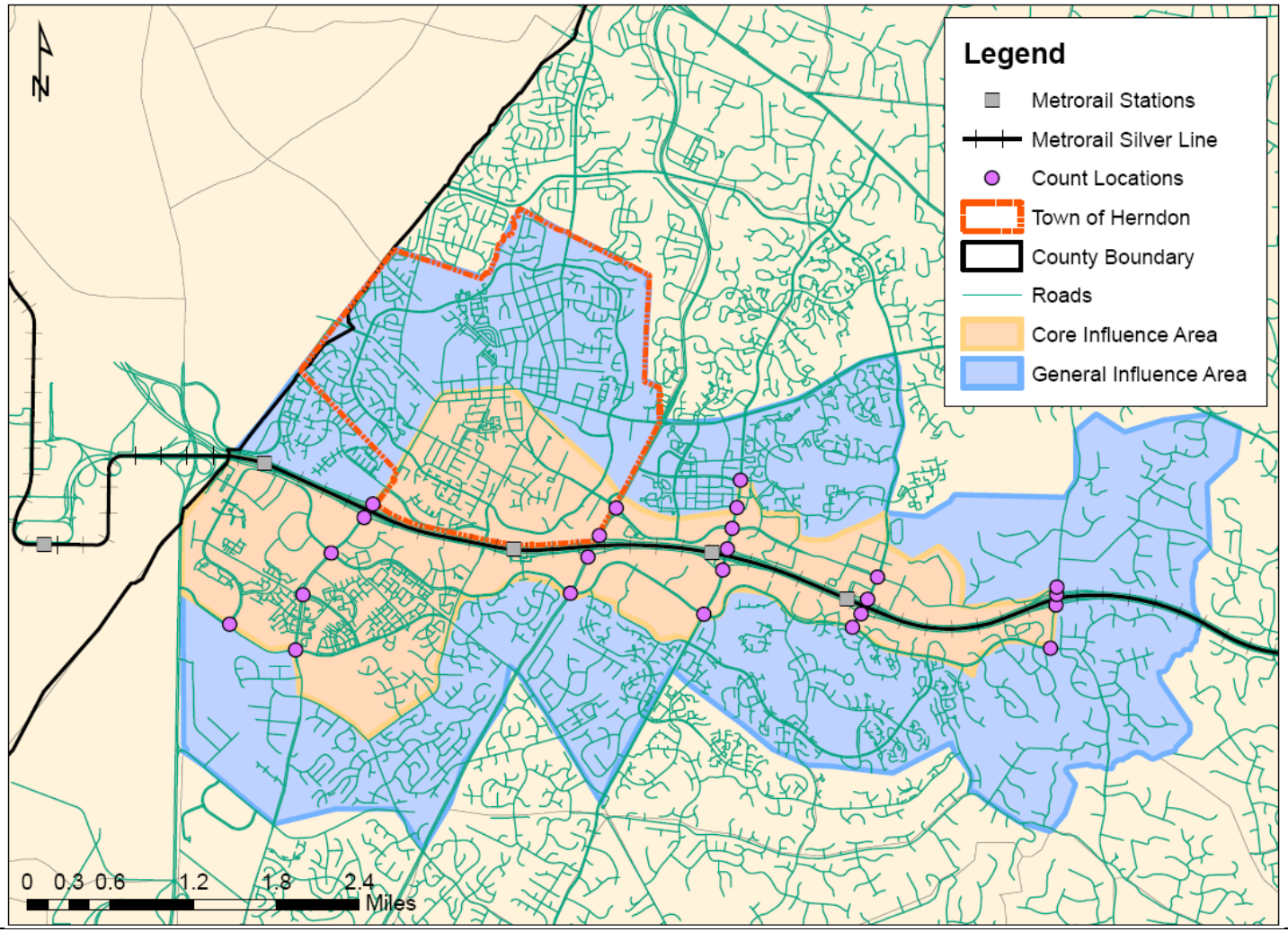
# TRANSPORTATION ANALYSIS PROCESS



# Purpose of Analysis

- Evaluation of Transportation Conditions Forecast for 2030
  - Identify Travel Trends and Patterns
    - Where people travel
    - How people travel
      - Introduction of Metrorail service
      - Other changes in transit service
  - Evaluate Roadway Performance
    - Systemwide calculation of key measures (e.g. Vehicle Miles Traveled (VMT))
    - Critical Intersections

# Study Area


N
Legend
Metrorail Stations
Metrorail Silver Line
Count Locations
Town of Herndon
County Boundary
Roads
Core Influence Area
General Influence Area
0 0.3 0.6 1.2 1.8 2.4
Miles

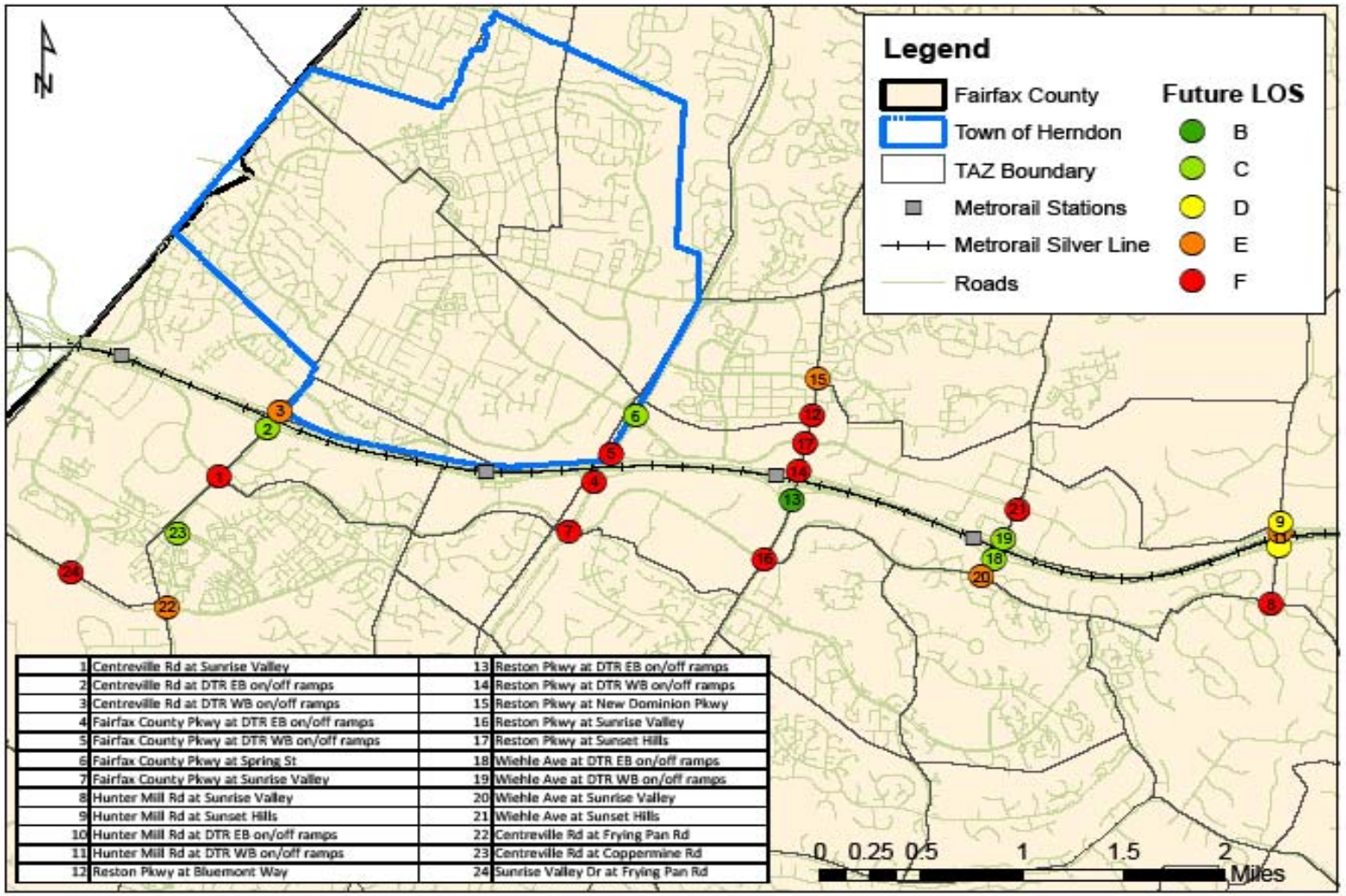
# Model Assumptions

- Region and Study Area
- **Land Use – MWCOG Round 8.0** New
- Road network improvements for 2030
- Transit
  - Stations along Phase II of Dulles Rail are open
  - Bus service is reoriented to serve rail stations and local area

# Road Improvements Assumed in 2030 Base

- Widening of Route 28 to ten lanes including an HOV lane in each direction
- Widening of the Fairfax County Parkway to six lanes including an HOV lane in each direction
- An overpass across the Dulles Toll Road near the County line (Rock Hill Road Overpass)
- An overpass across the Dulles Toll Road west of Wiehle Avenue (Soapstone Overpass)
- An underpass under the Dulles Toll Road west of Reston Parkway (Town Center Parkway/Edmund Halley Drive Underpass)
- Widening of Centreville Road to six lanes per County Transportation Plan
- The extension of Sunrise Valley Drive south of Frying Pan Road, completion of improvements to West Ox Road and Reston Parkway, and widening/improvement of Fox Mill Road, Monroe Street, and Frying Pan Road

# 2030 Evening Peak Hour Level of Service (Round 8.0 Land Use)




| | | | |
|---|---|---|---|
| 1 | Centreville Rd at Sunrise Valley | 13 | Reston Pkwy at DTR EB on/off ramps |
| 2 | Centreville Rd at DTR EB on/off ramps | 14 | Reston Pkwy at DTR WB on/off ramps |
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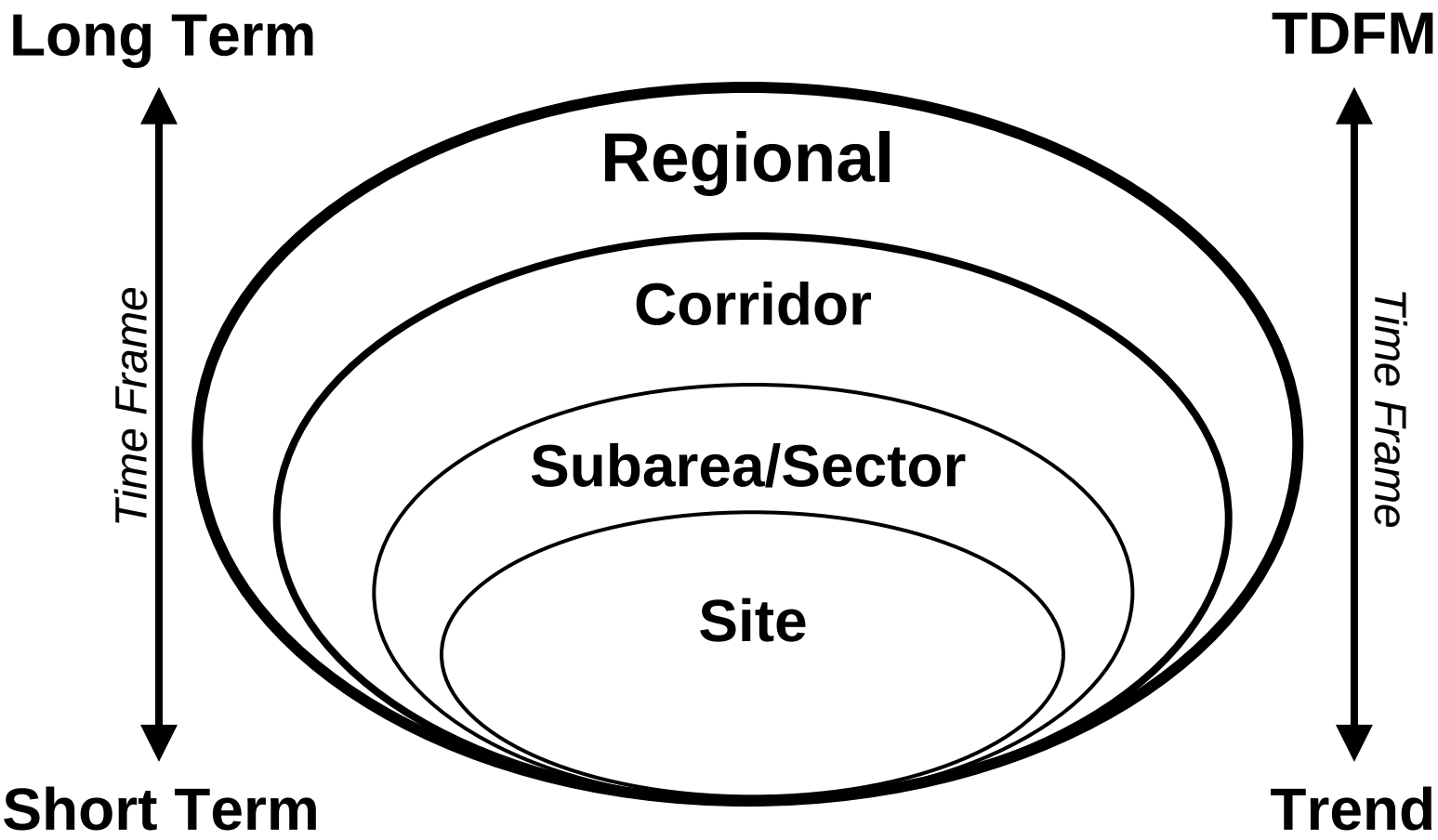
# General Mitigation Strategies

- Strategic Land Use (TOD)
  - Mixed –Use, Location, Type
- Local Connections
- Enhanced Pedestrian and Bicycle Paths
- Increase Use of Transit
- Enhanced TDM
- Traffic Operations
- Intersection Improvements

# Selected Problem Intersections Examined

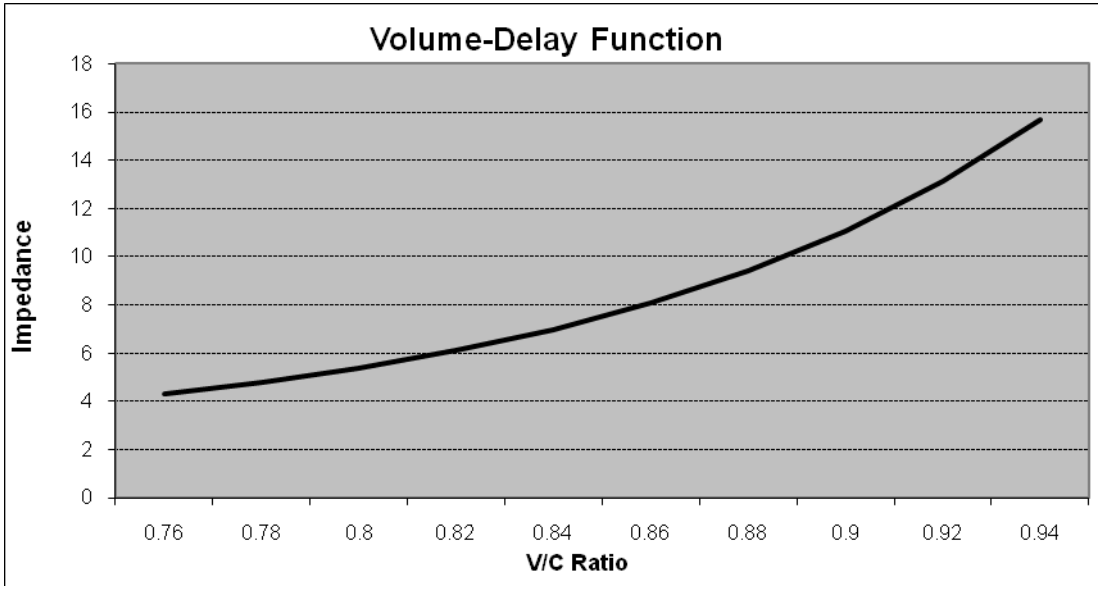
- Mitigation Measures Suggested, But Not Tested
  - Wiehle and Sunset Hills
  - Wiehle and Sunrise Valley
  - Reston Parkway and Sunset Hills
  - Reston Parkway and Sunrise Valley

# Overview of Travel Demand Forecasting


Long Term
TDFM
Regional
Corridor
Subarea/Sector
Site
Time Frame
Time Frame
Short Term
Trend

# What is a Model?

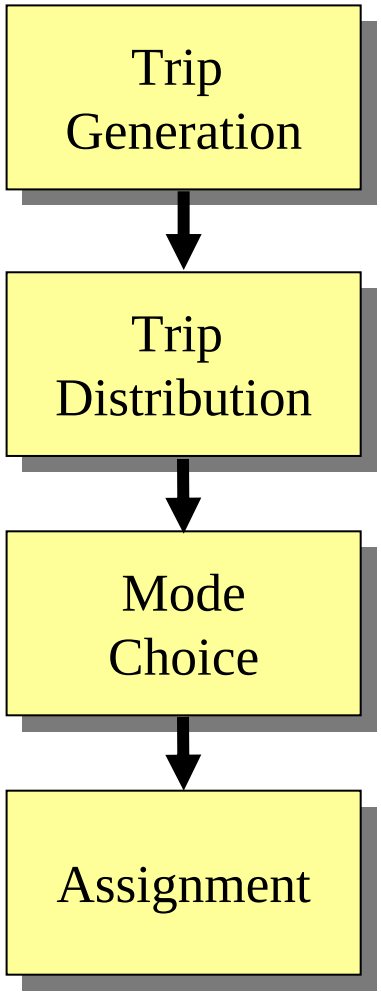
$$T_c = t_o \times \left[1 + \alpha \left(\frac{v}{c}\right)^{\beta}\right]$$



# Travel Demand Forecast Models

- Proposed Land Use
- Proposed Highway and Transit Facilities
- Impact of Land Use on the Transportation System

# Four-Step Model Process

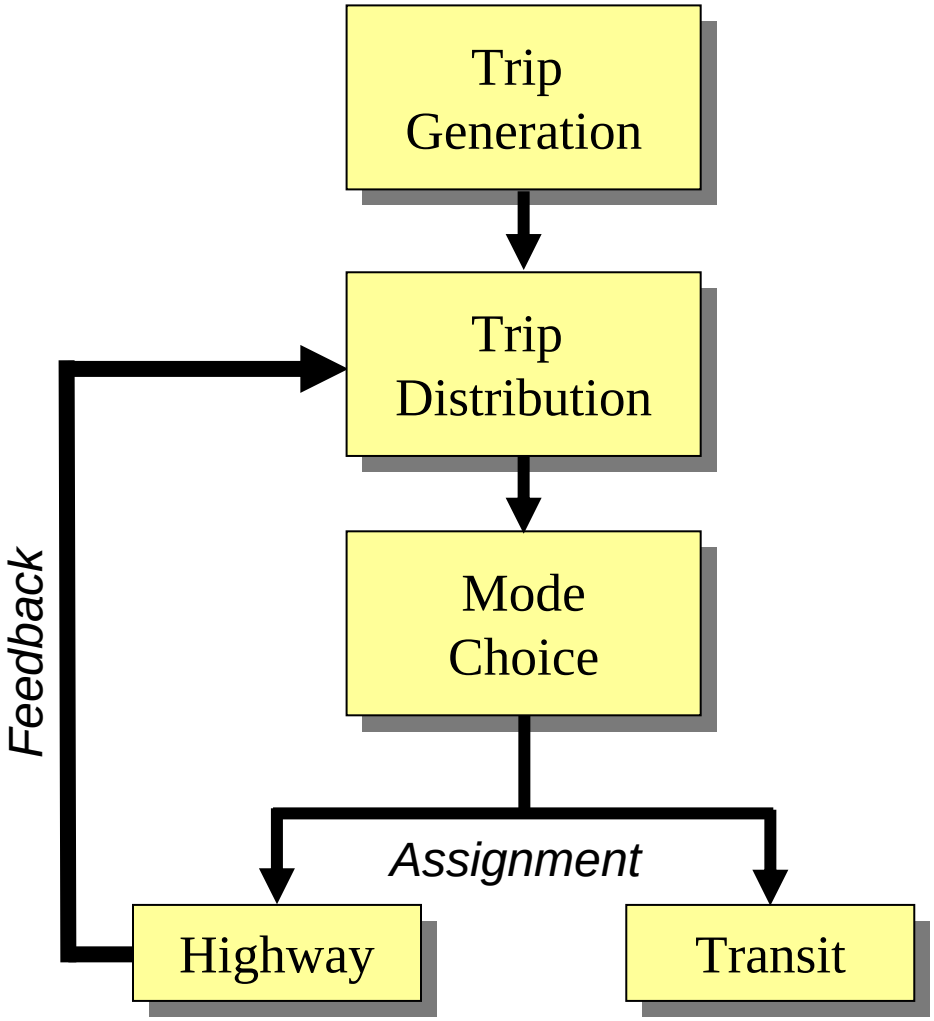



**Why**

**Where**

**How**

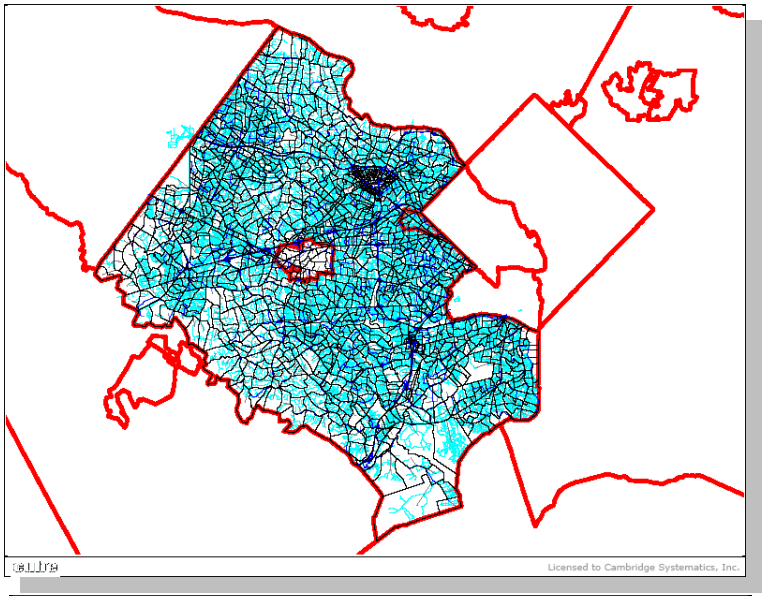
**Which**

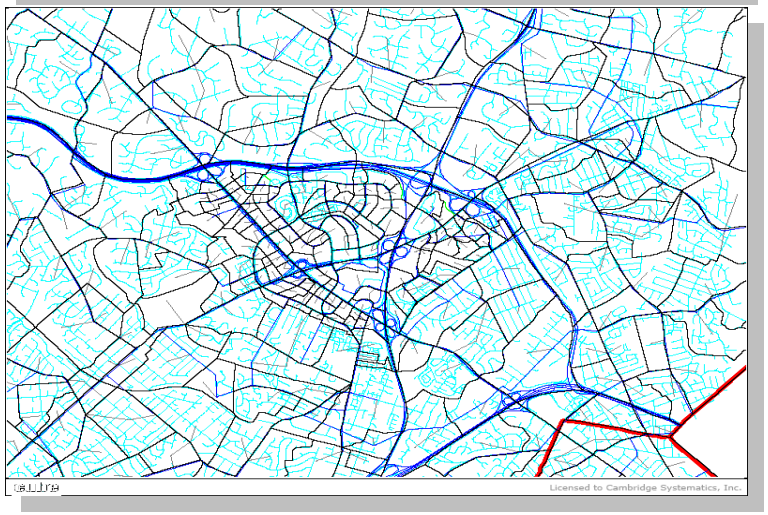

Trip Generation
Trip Distribution
Mode Choice
Feedback
Assignment
Highway
Transit

# Four-Step Model Process

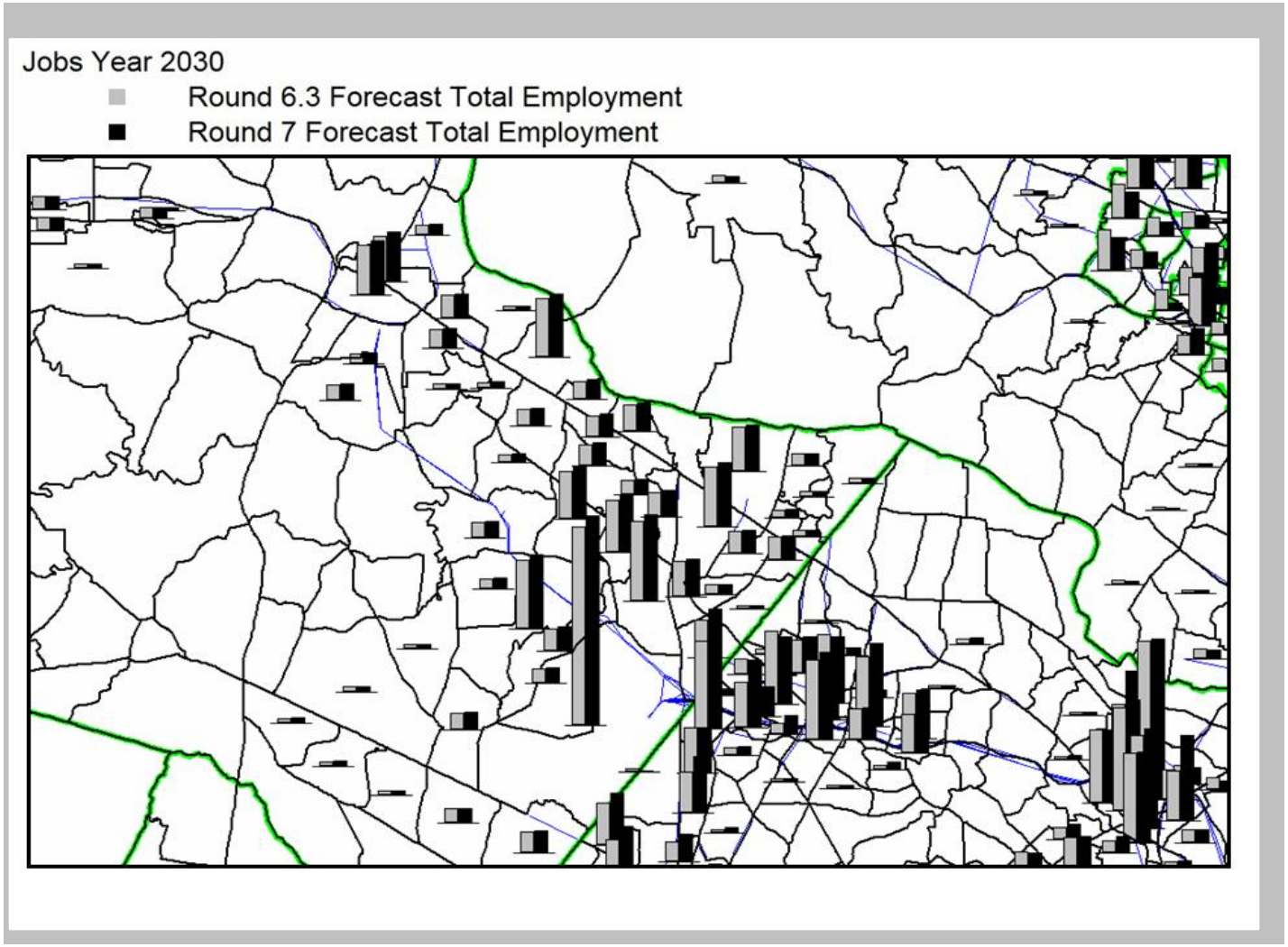
## Basic Inputs:

- Land-Use
  - Employment Type
  - Households
- Aggregated TAZ
  - Major Highway Facilities
  - Homogenous Land Use

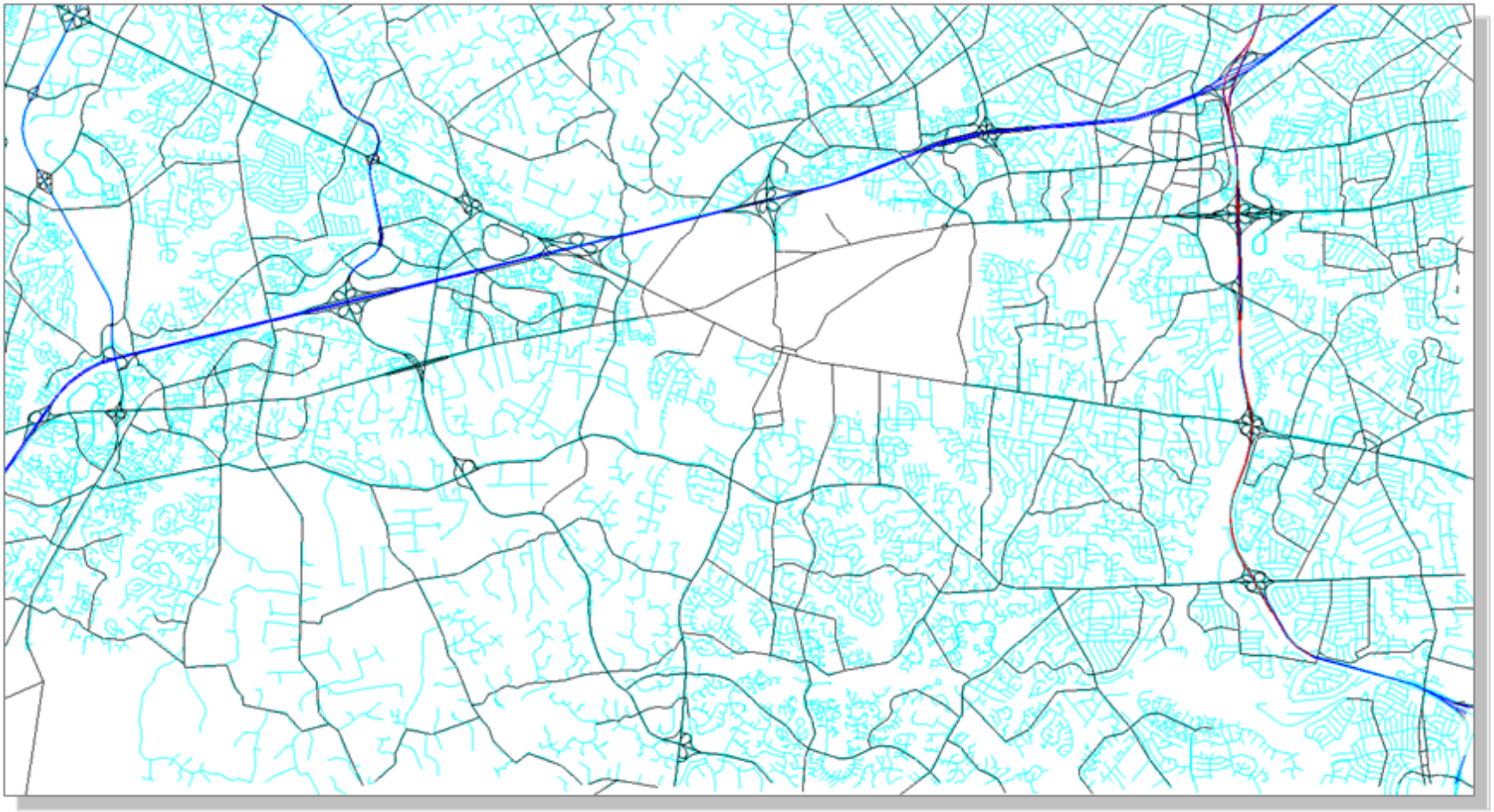


*Future year land use forecast can change over time as economic conditions change.*



# Network



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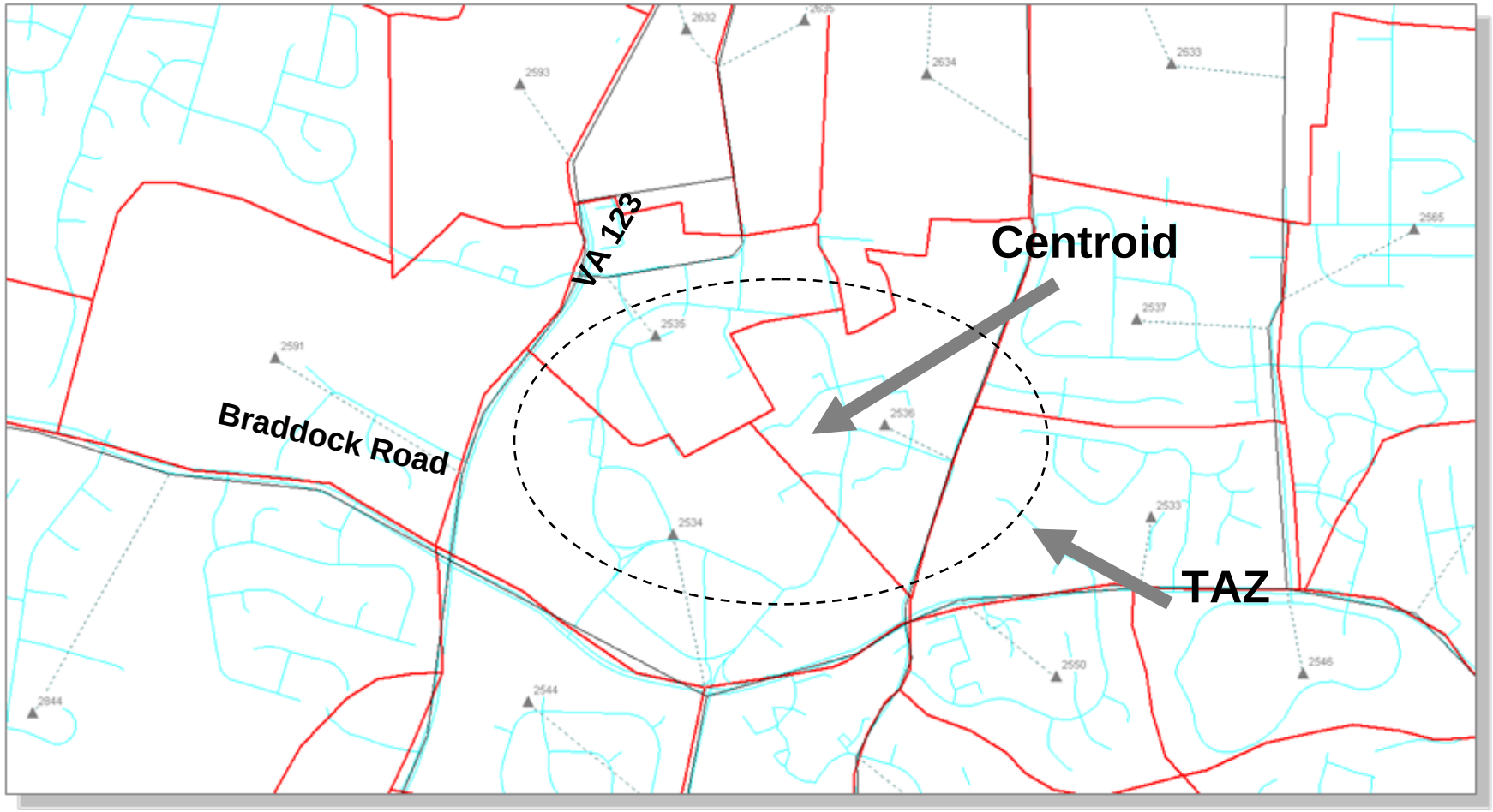
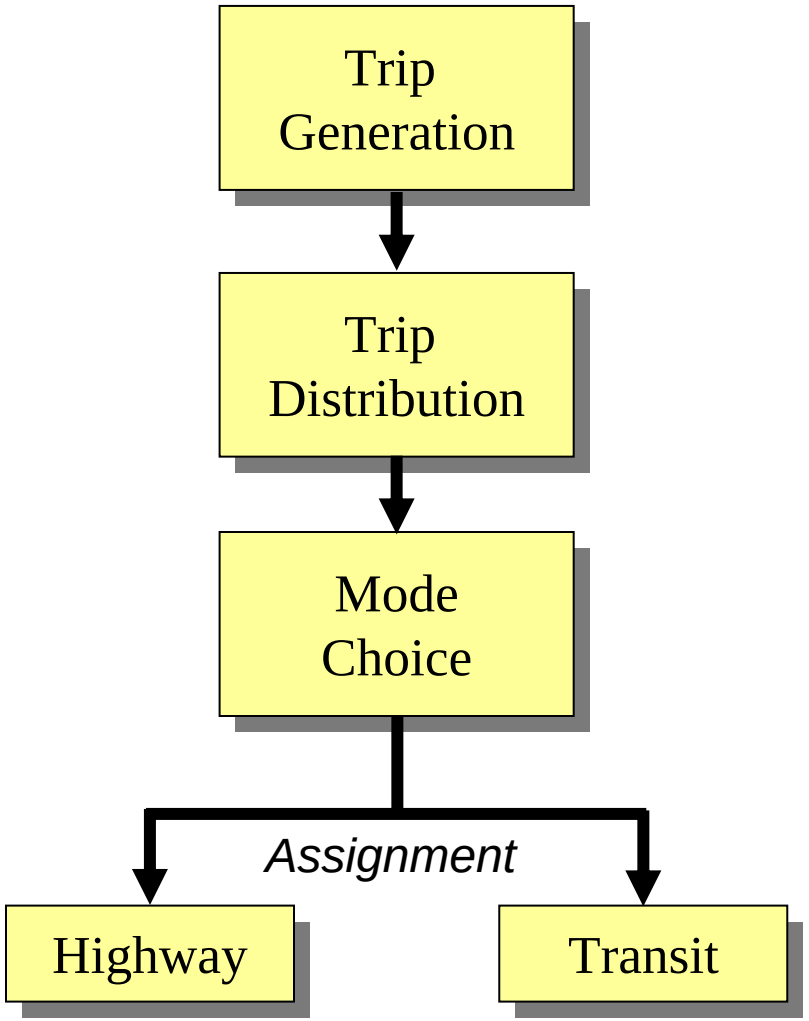
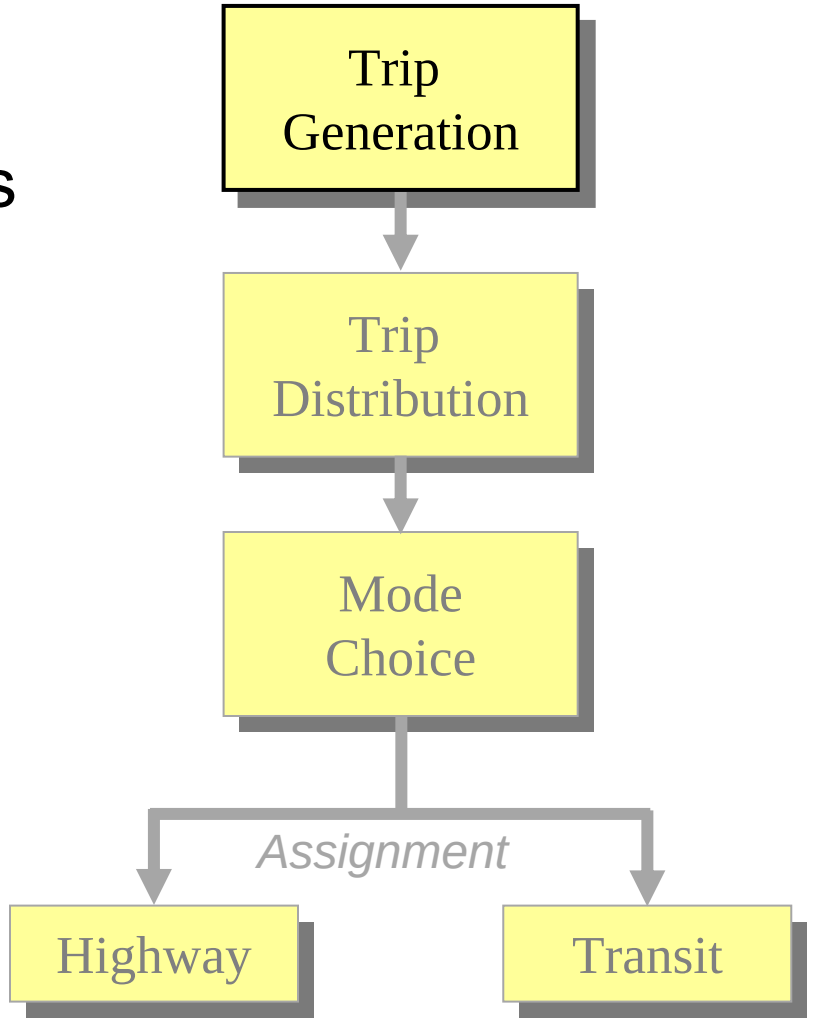





FCDOT Serving Fairfax County for 30 Years and More

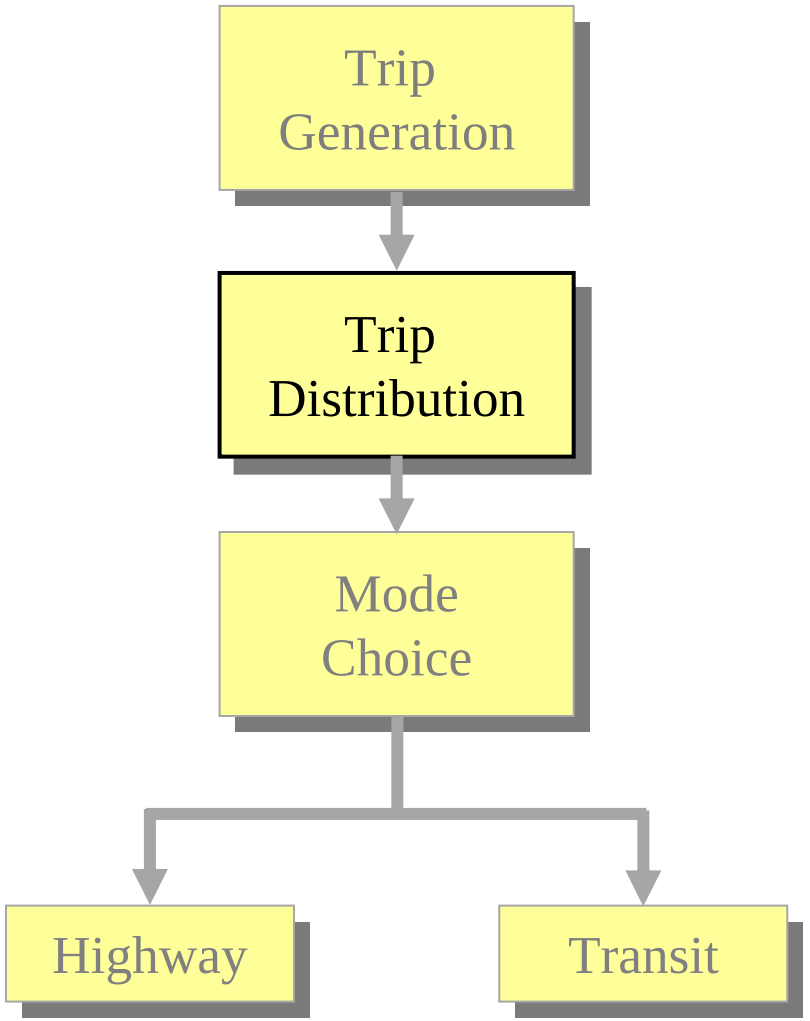

Trip Generation
Trip Distribution
Mode Choice
Assignment
Highway
Transit

- Input ➔ Land Use
- Output ➔ Person Trip Ends
  - Productions
  - Attractions
- Regression Equations
- Cross-Classification
- Balance on Productions

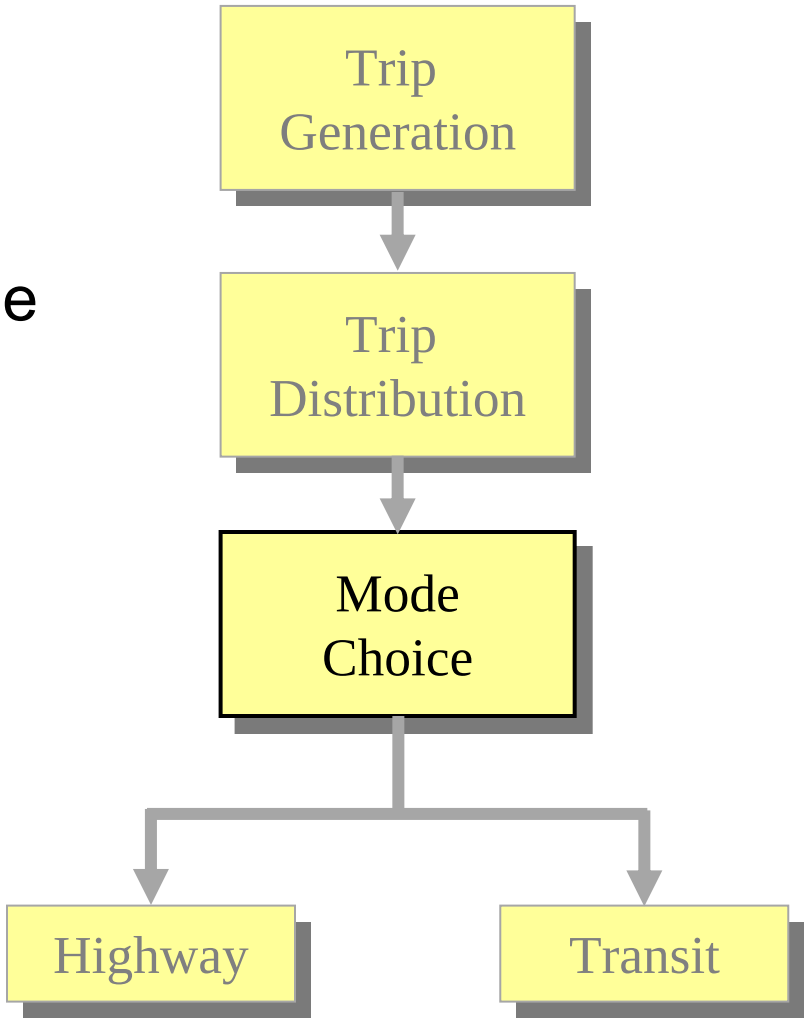


- Gravity Model
- Input ➔ Person Trips by Purpose
- Output ➔ Origins and Destinations

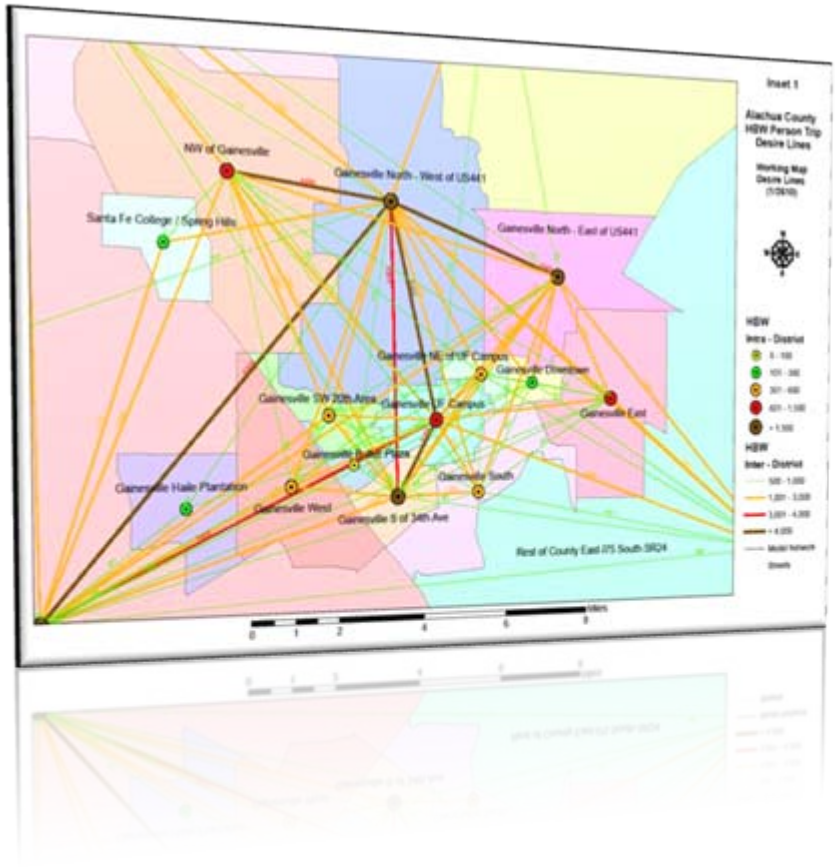
$$Trips_{ij} = P_i \times \frac{A_j \times FF_{ij} \times K_{ij}}{\Sigma(A_j \times FF_{ij} \times K_{ij})}$$



- Input → Person Trips by Purpose and Origin/Destination
- Output → Person Trips by Purpose and Origin/Destination and Mode
- Zonal Level
- Logit Model
- Probability



- Parameters:
  - Destination
  - Cost
  - Travel Time



# Travel Time Components

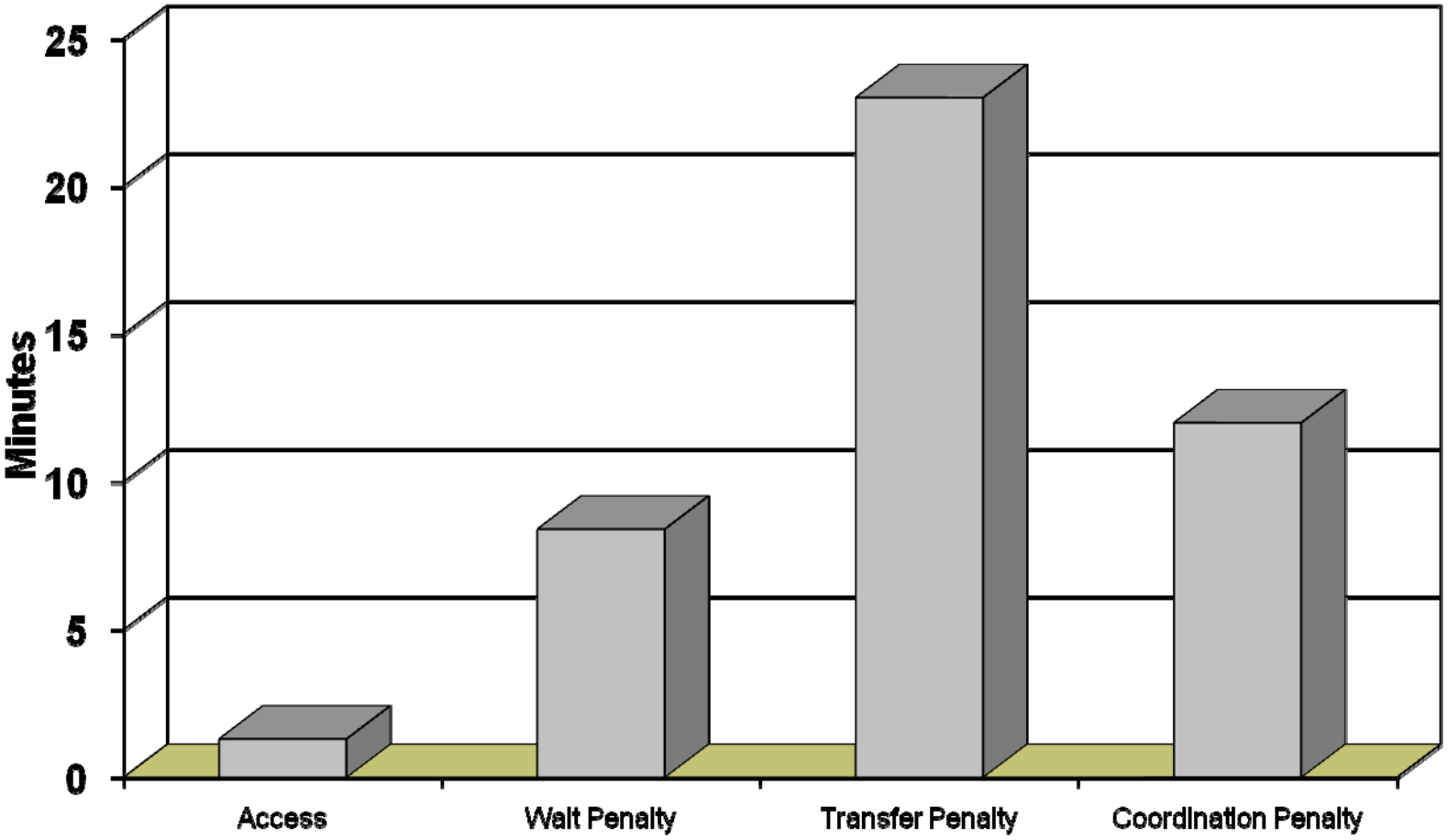
$$P(k) = \frac{e^{U_k}}{\sum_x e^{U_x}}$$

$$U = a_o + a_1 q_1 + a_1 q_1 + a_2 q_2 + \ldots\ldots + a_x q_x$$

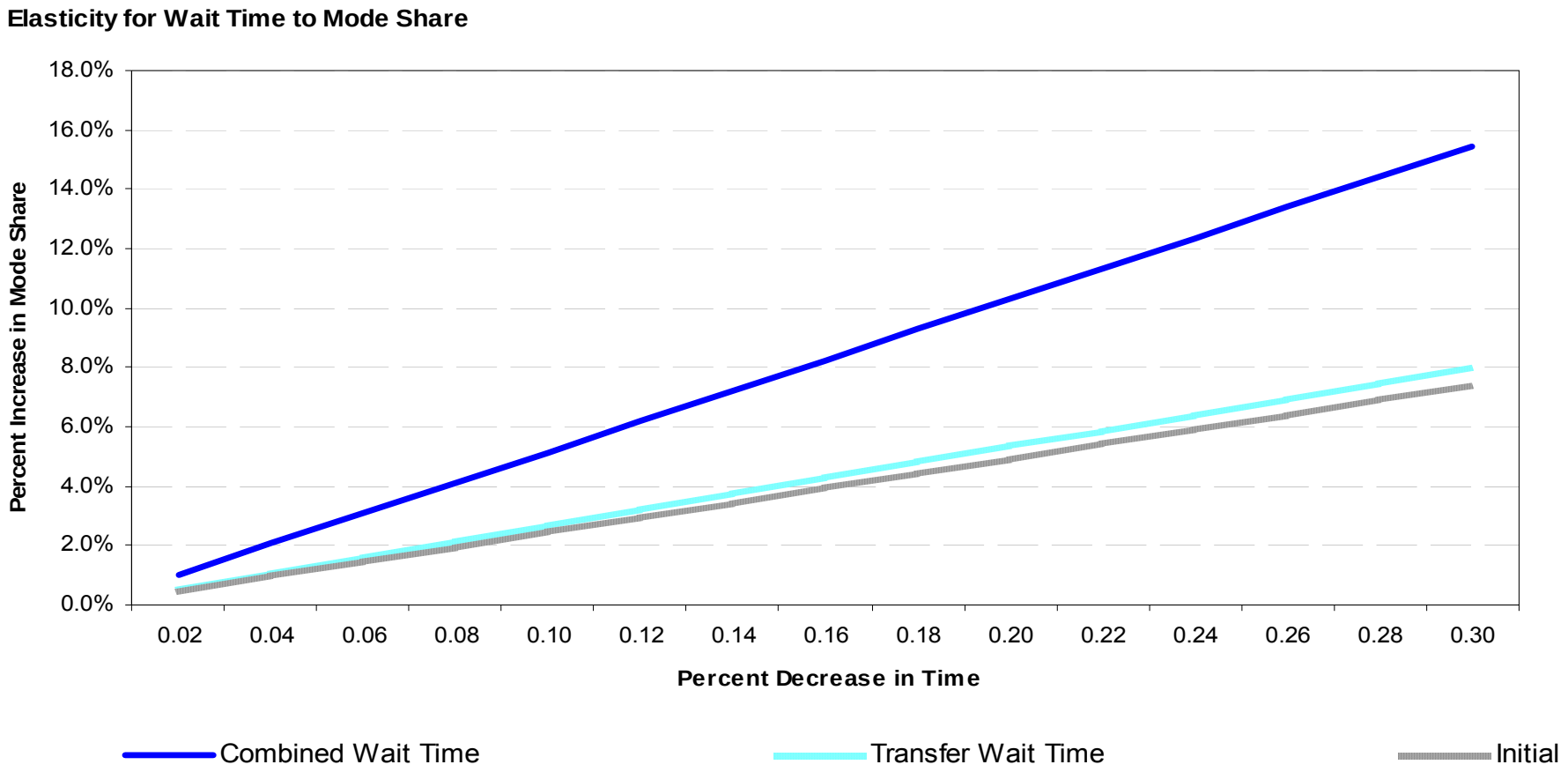
$$TRAN = 0.0583 \times WT + 0.0583 \times IWT + 0.637 \times TT + 0.0173 \times TIVT + 0.0173 \times TOVT + 0.0044 \times F + Abias + 0.0173 \times ACONN$$

- In-Vehicle Time
- Out of-Vehicle Time
  - Access Time
  - Initial Wait Time
  - Transfer Wait
  - Egress Time

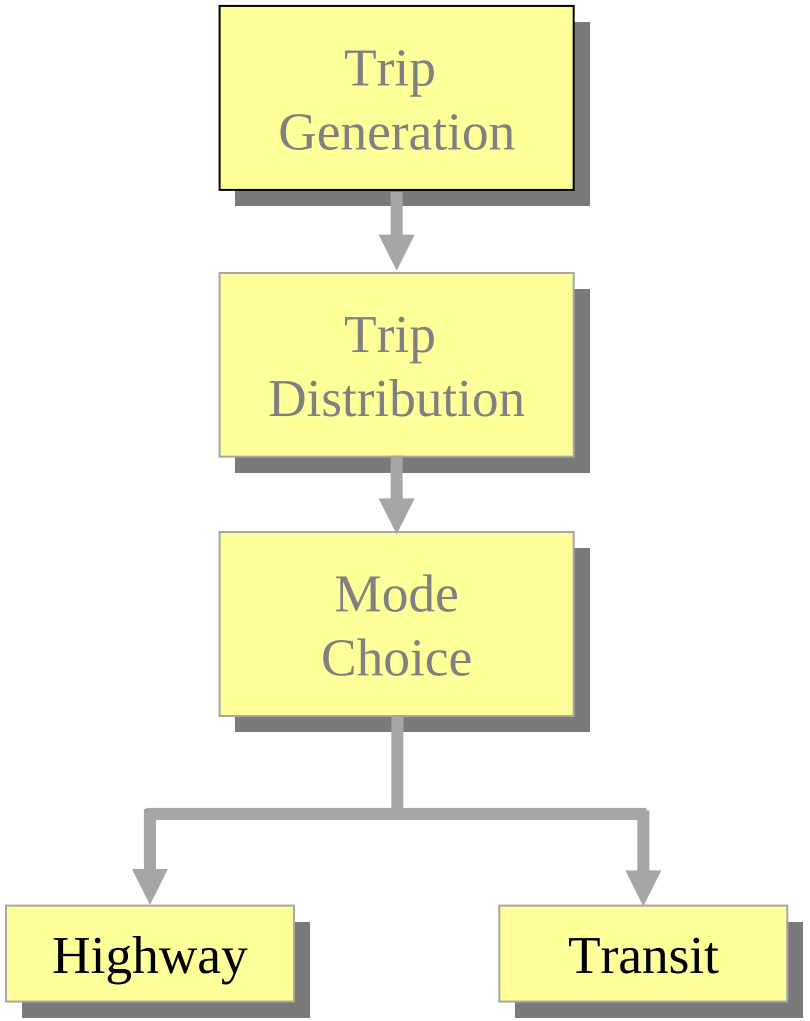
# Wait Time Disutility (Bus)



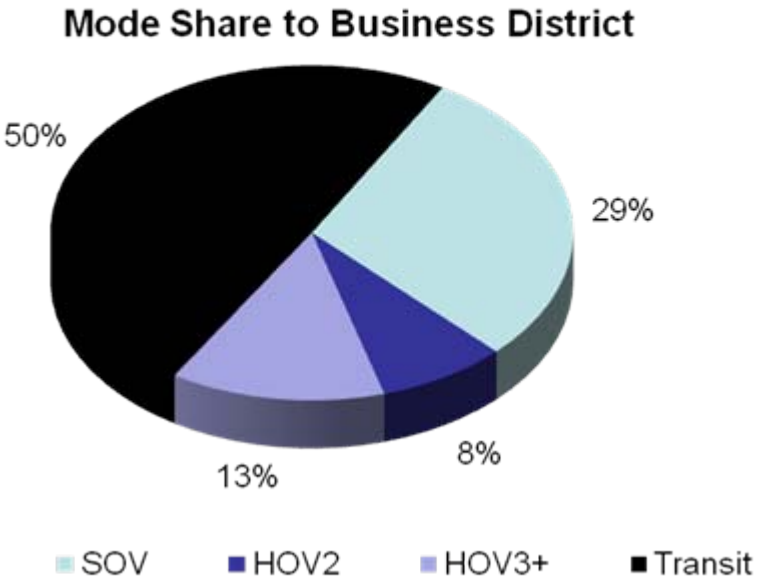
# Mode Choice Elasticity



- Input ➔Trip Tables
- Output ➔ Loaded Network
- Highway
  - Incremental Capacity Constraint
  - Equilibrium
- Transit
  - All-or-Nothing (AON)



# Typical Model Outputs (used in analysis)




- Traffic Volumes
- Transit Ridership
- Mode Shares
- Origins & Destinations

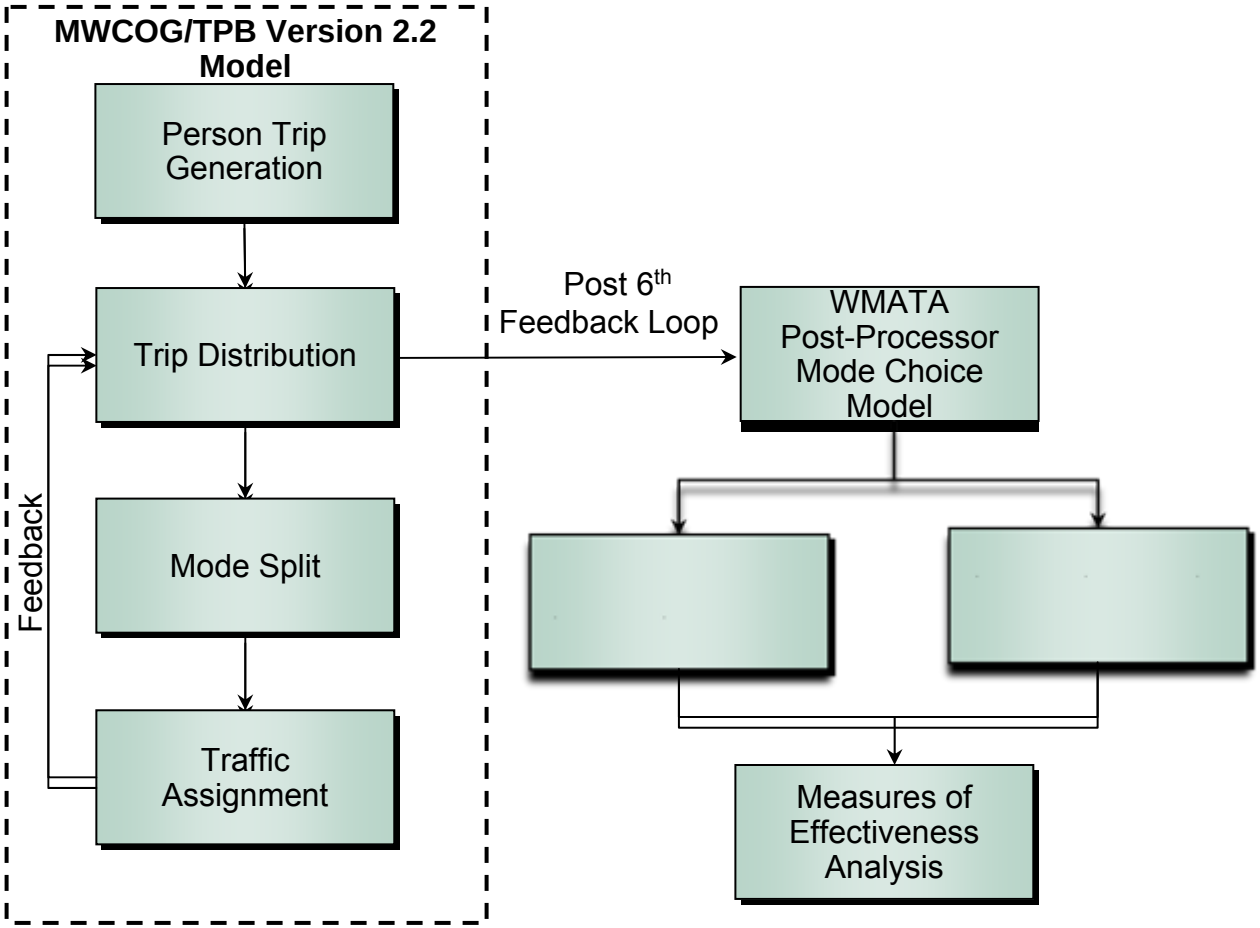
# MWCOG/TPB Travel Demand Forecast Model

- Series of Sequential Models
- State of the Practice
- Trip End Model
- Person Trips
- Validation
  - Regional
  - Study Area

# Forecasting Application

WMATA Post-Processor provides enhanced transit forecasting capabilities.

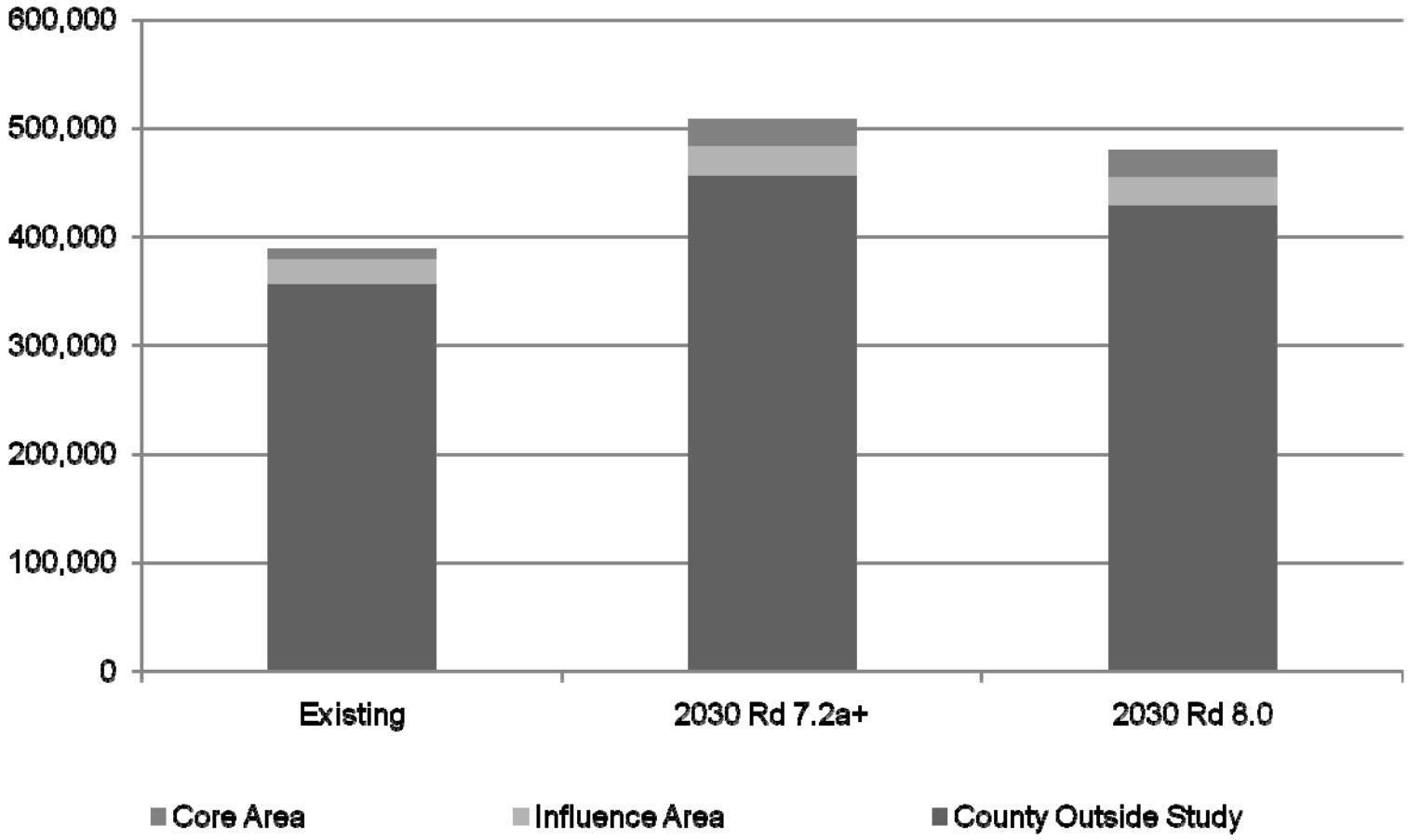
Fairfax County submodel provides enhanced highway assignment capabilities.



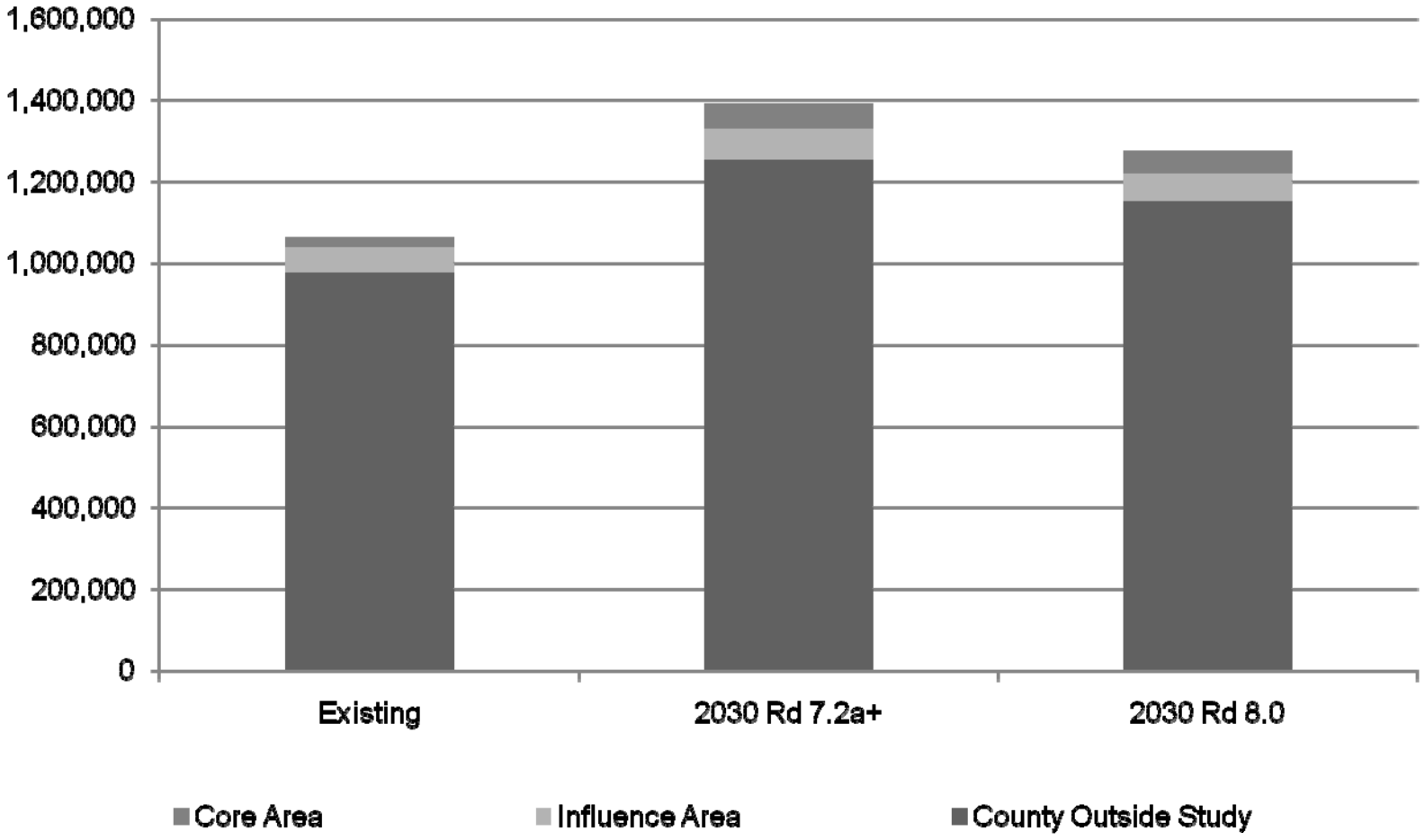
# Transportation Demand Management

- The Demand Model & TDM
  - Parking & Congested Pricing
  - Transit & HOV Policy
  - Trip Rates
    - Auto Ownership
    - Income
    - Non-Motorized
    - Telecommuting
    - Land Use Density (Area Types)

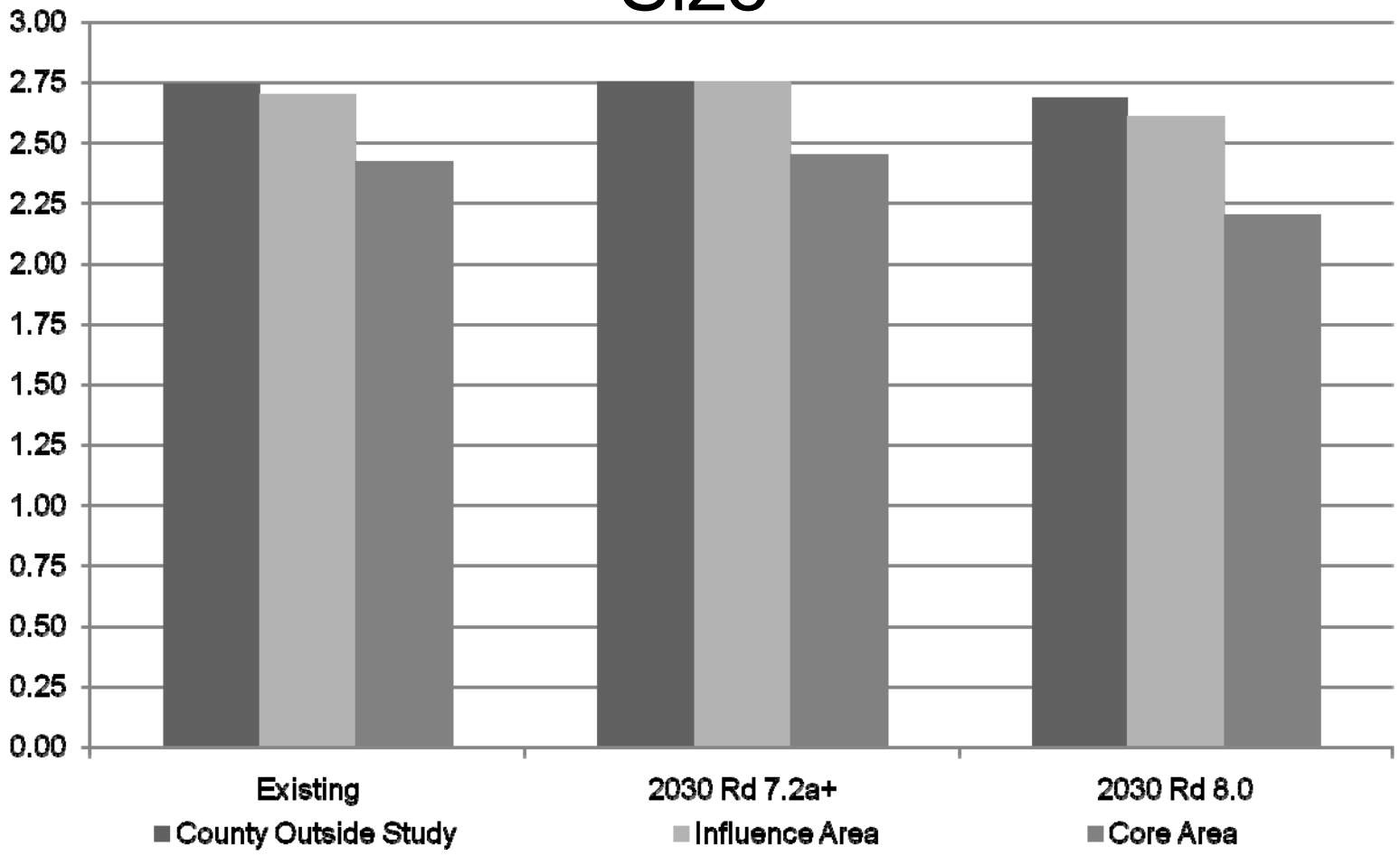
# Comparison of Land Use Data - Households



# Comparison of Land Use Data - Population



# Comparison of Land Use Data – Household Size





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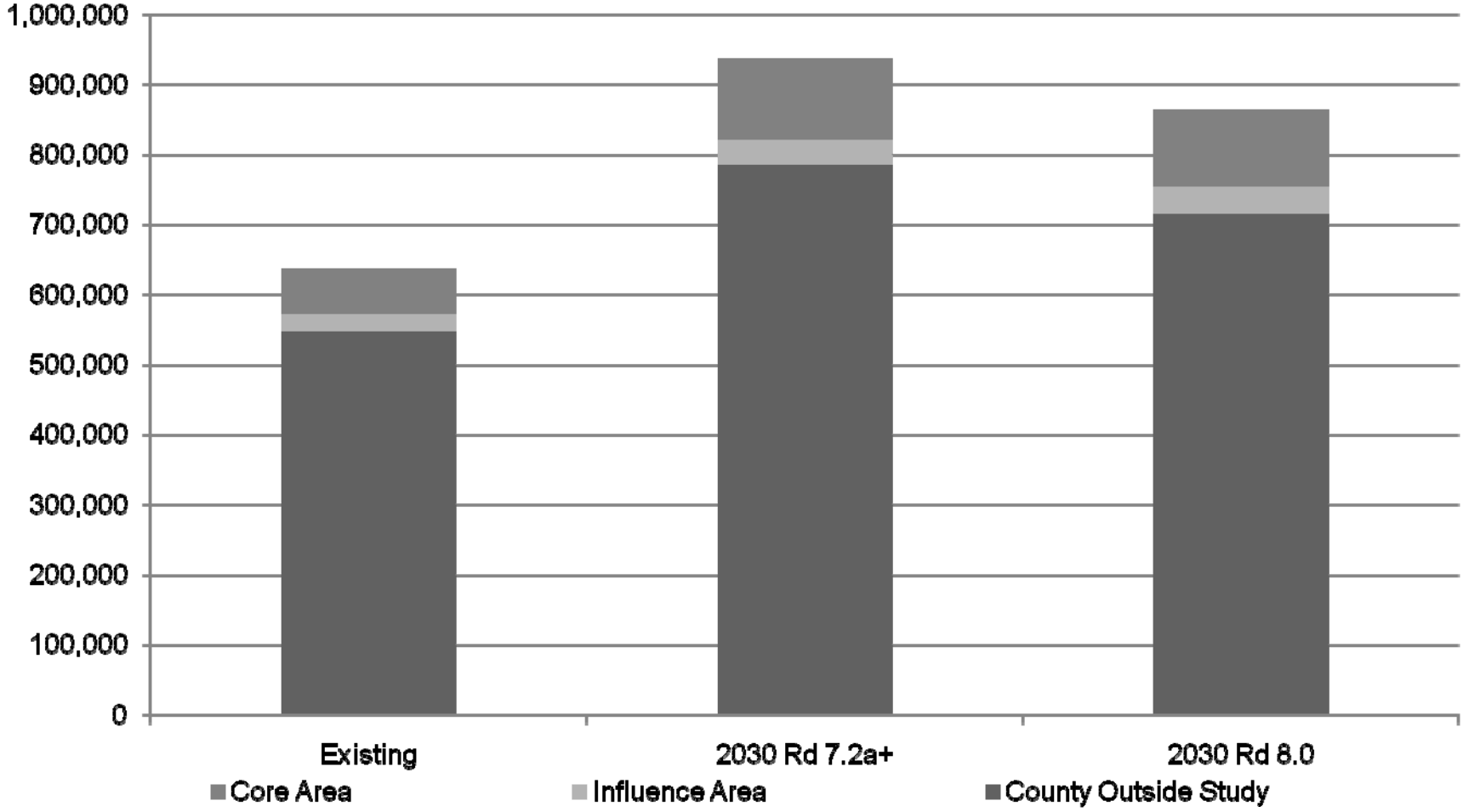
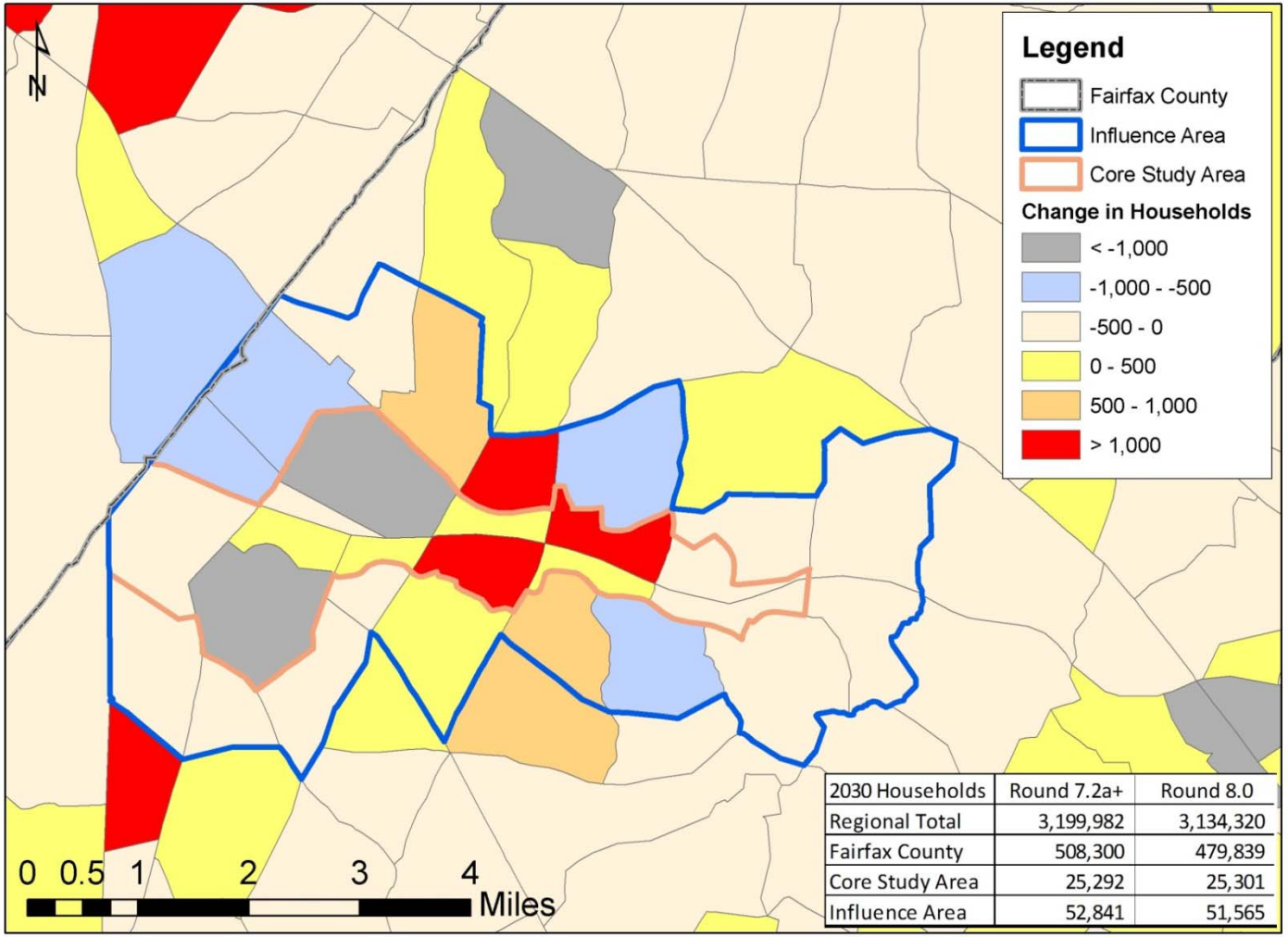
# Comparison of Land Use Data - Employment

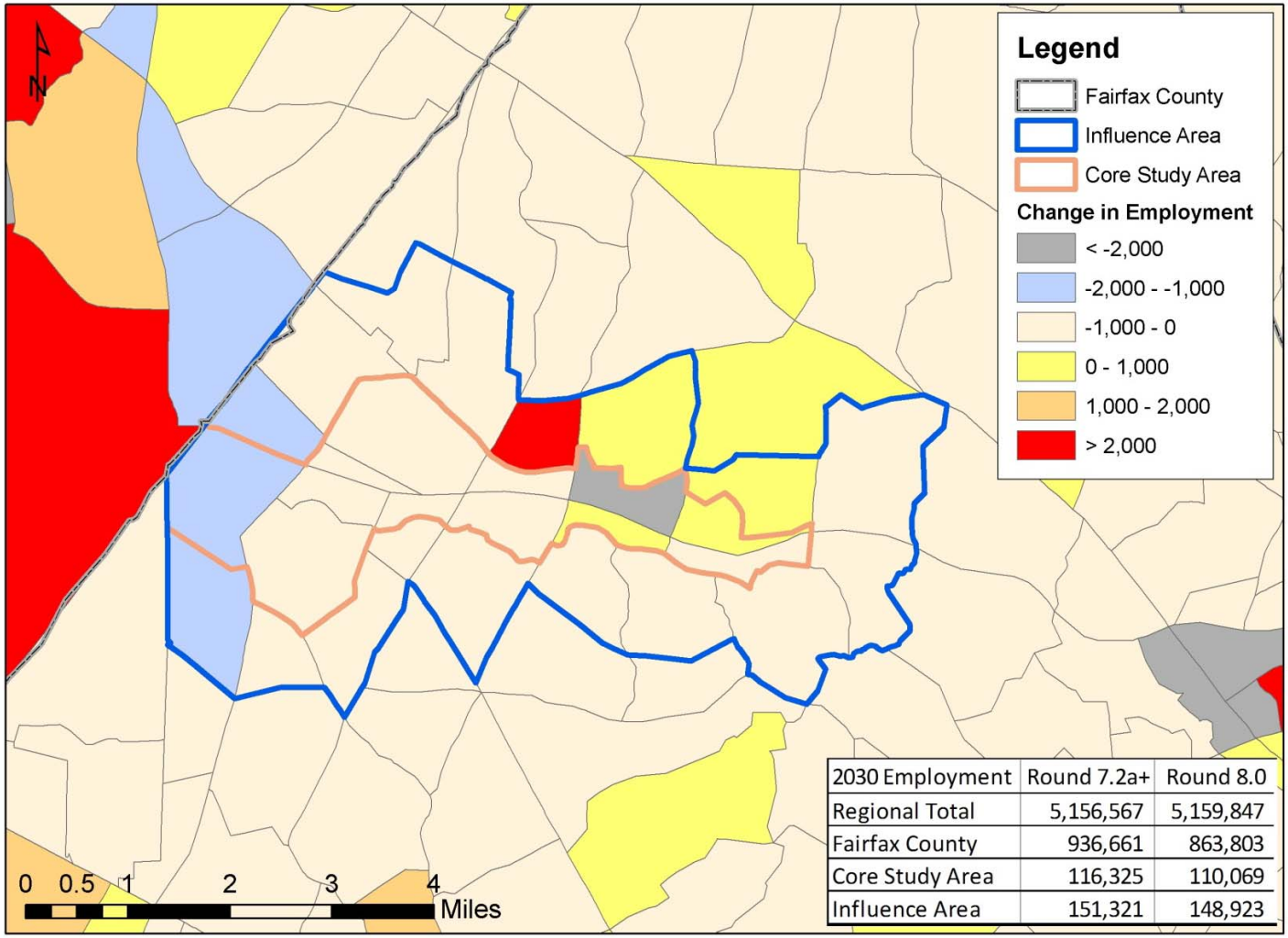


# Round 7.2a and Round 8.0 Land Use Comparison



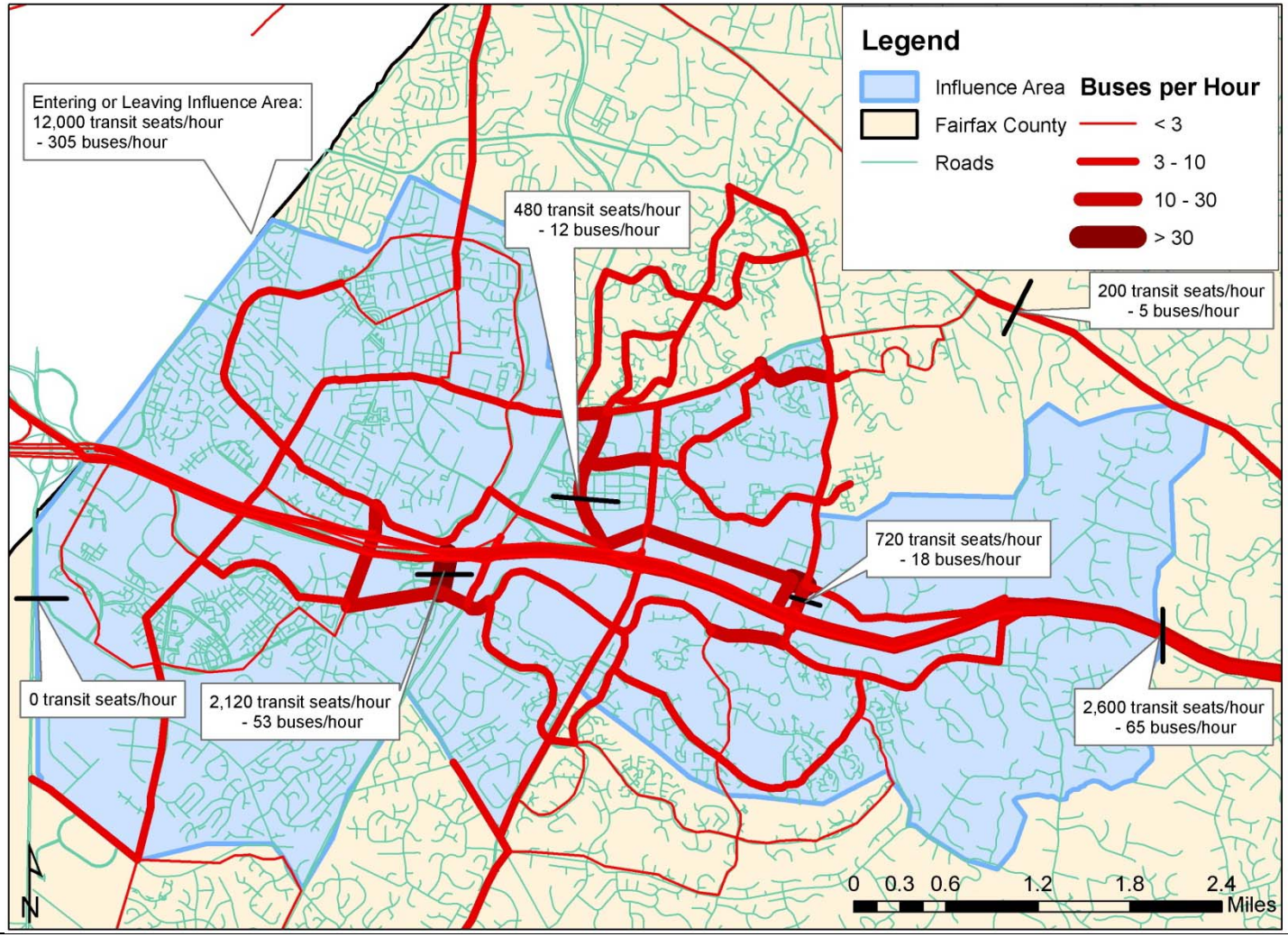

| 2030 Households | Round 7.2a+ | Round 8.0 |
|---|---|---|
| Regional Total | 3,199,982 | 3,134,320 |
| Fairfax County | 508,300 | 479,839 |
| Core Study Area | 25,292 | 25,301 |
| Influence Area | 52,841 | 51,565 |

# Round 7.2a and Round 8.0 Land Use Comparison

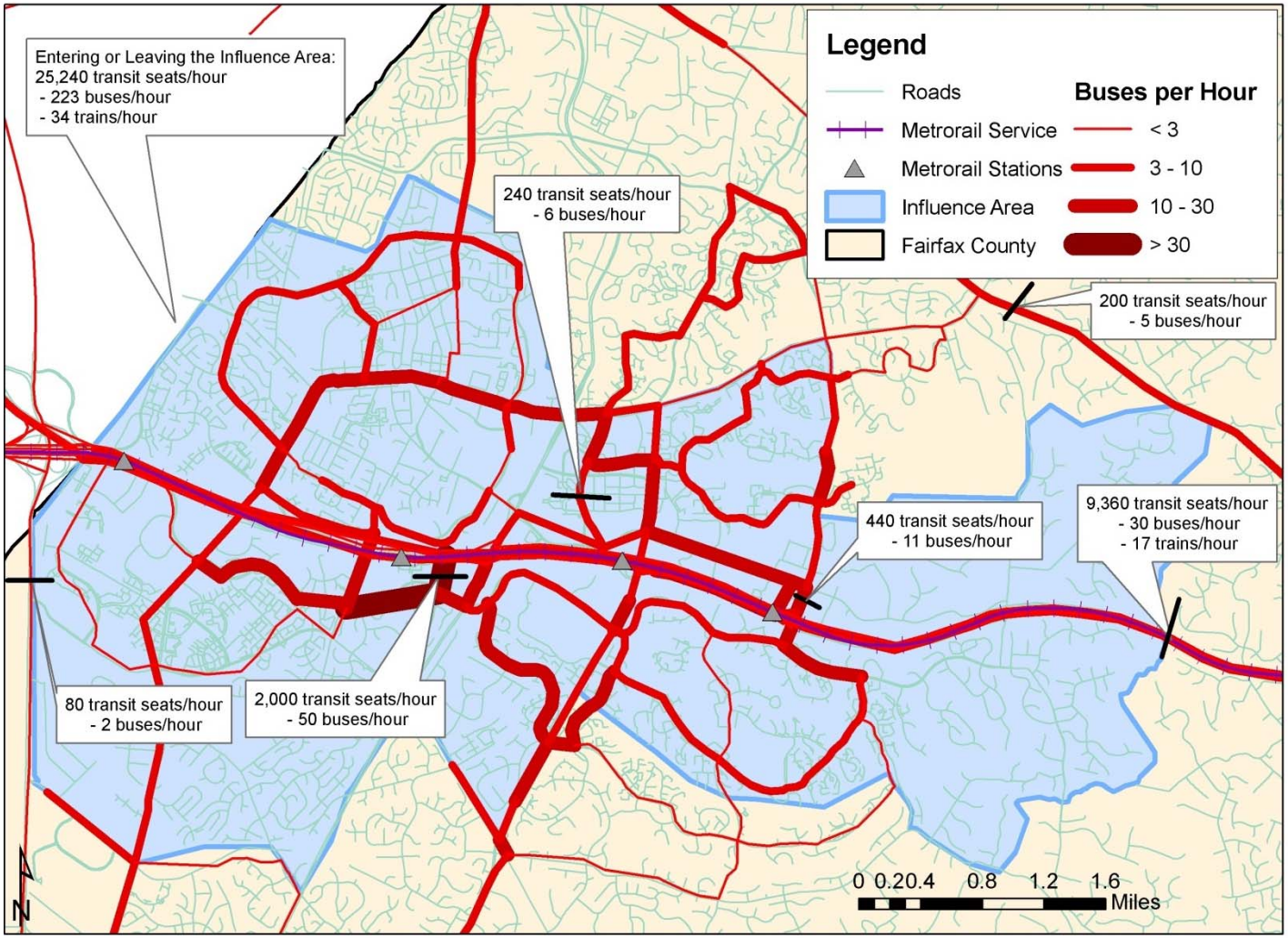



| 2030 Employment | Round 7.2a+ | Round 8.0 |
|---|---|---|
| Regional Total | 5,156,567 | 5,159,847 |
| Fairfax County | 936,661 | 863,803 |
| Core Study Area | 116,325 | 110,069 |
| Influence Area | 151,321 | 148,923 |

# Existing Peak Period Transit Service



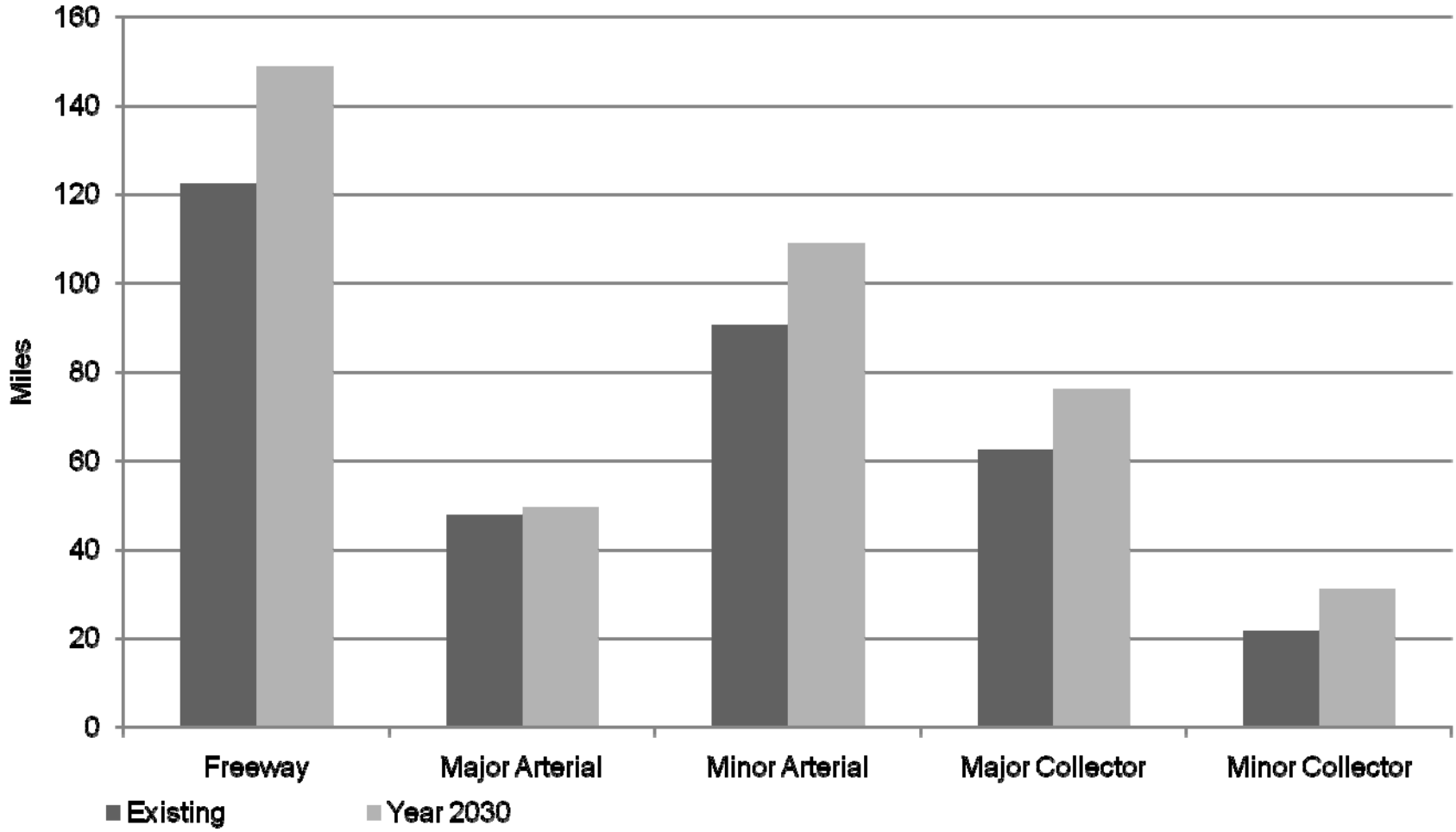
# Future Peak Period Transit Service



# Transit Service Changes

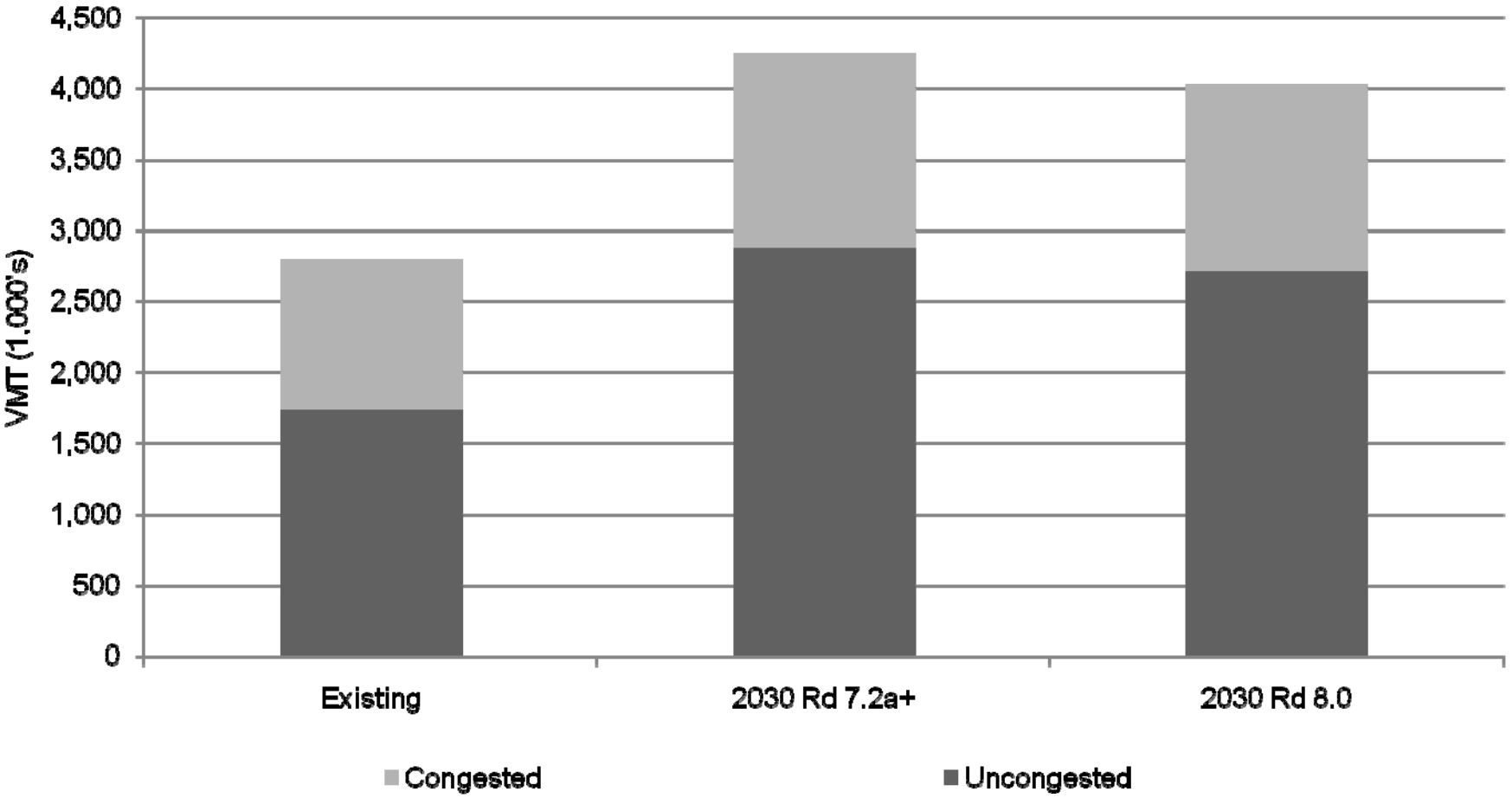
- Metrorail Service
  - 7-minute peak period frequency in both directions
  - 4 stations in the study area
- Bus Service Changes
  - 11 Feeder Routes no longer connecting to West Falls Church providing service to Wiehle Avenue instead
  - Local routing changes for 7 routes
  - Frequency changes for 8 routes
  - Removal of 4 redundant routes
  - Addition of 3 routes providing additional local and express service

# Study Area Lane Miles

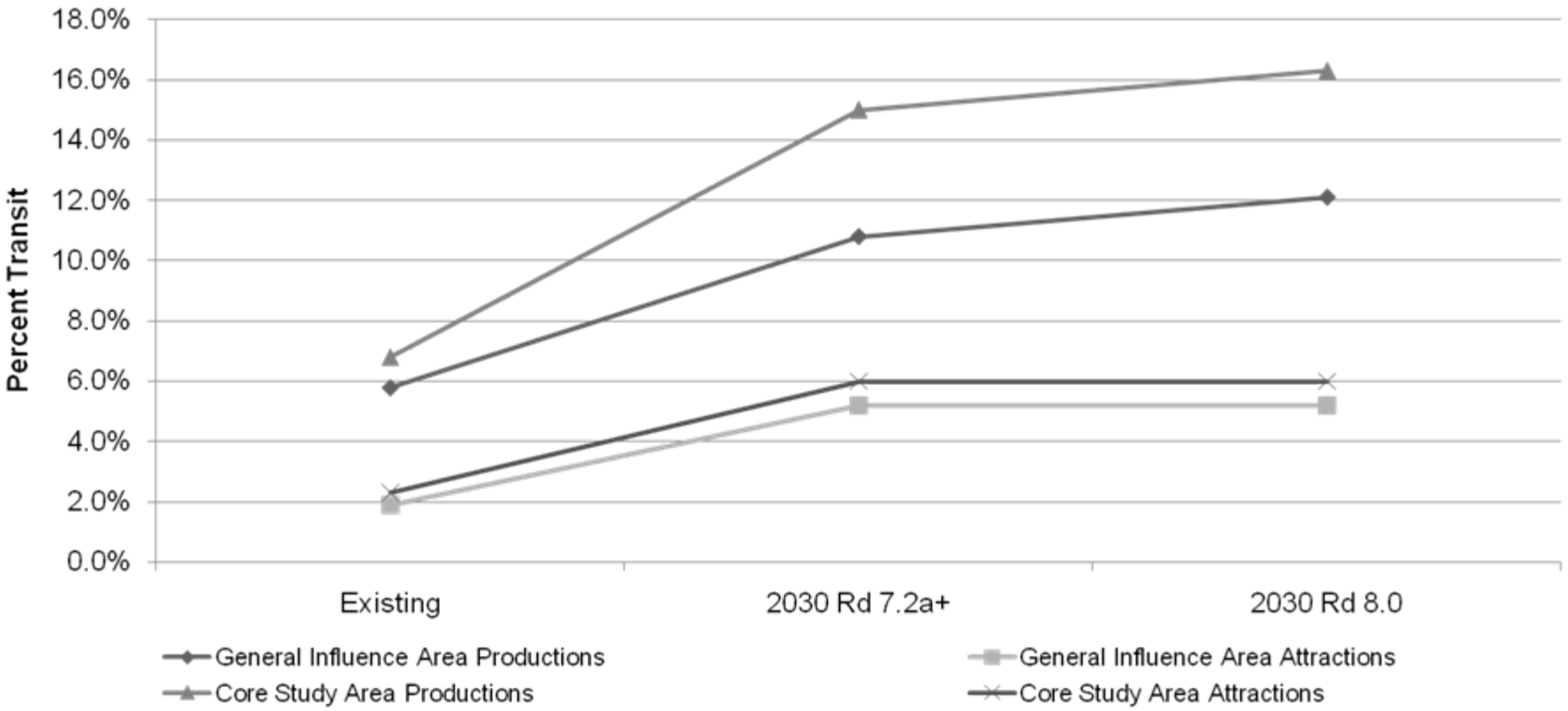


# Summary Results

# Study Area Vehicle Miles Traveled (VMT)



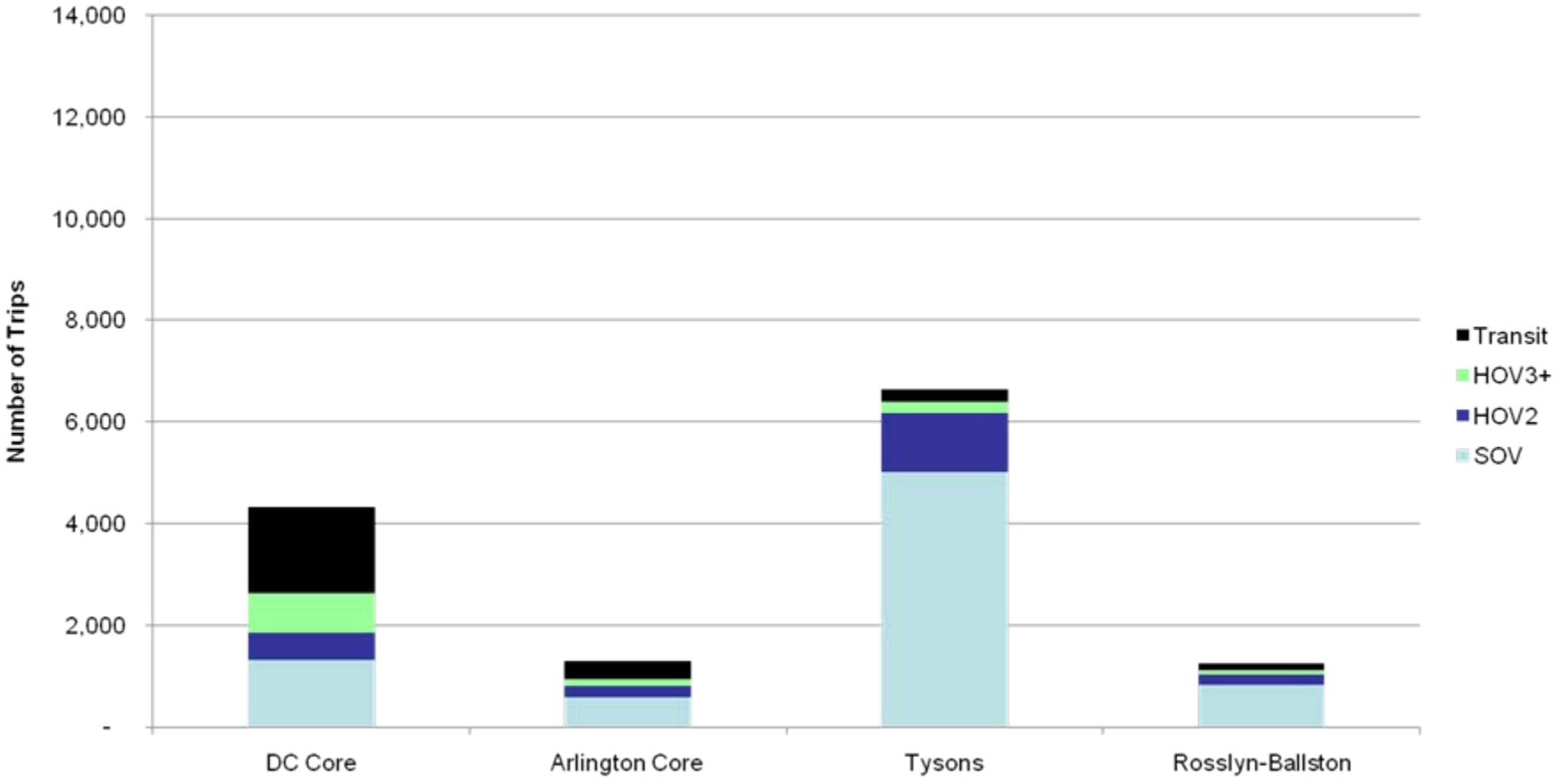
# Transit Mode Share for the Study Corridor




***Year 2030 Rd 8.0 Transit Oriented Develop Transit Mode Shares:***

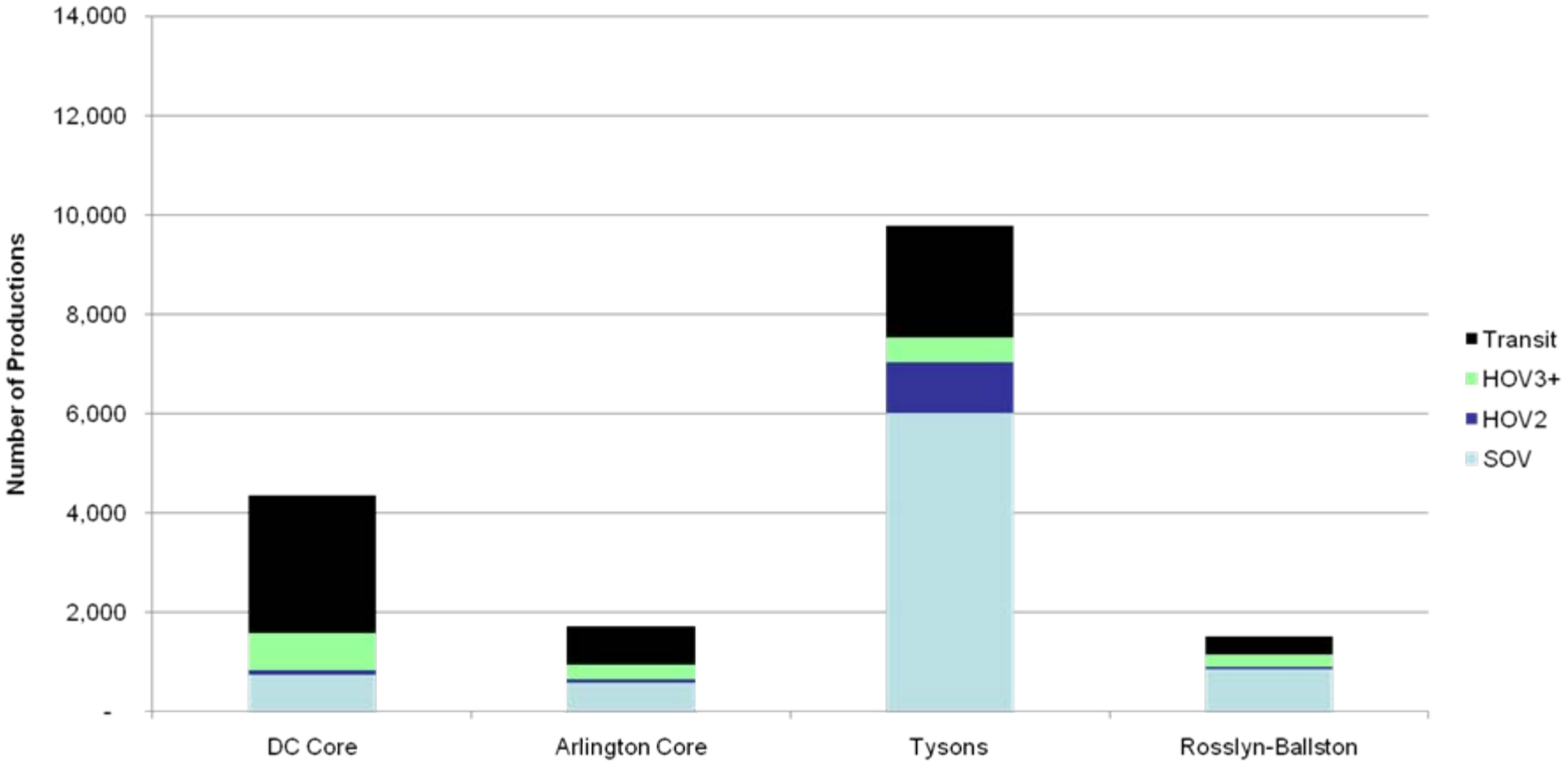
- ***Productions 24%***
- ***Attractions 25%***

# Existing Work Trips From the Corridor by Mode



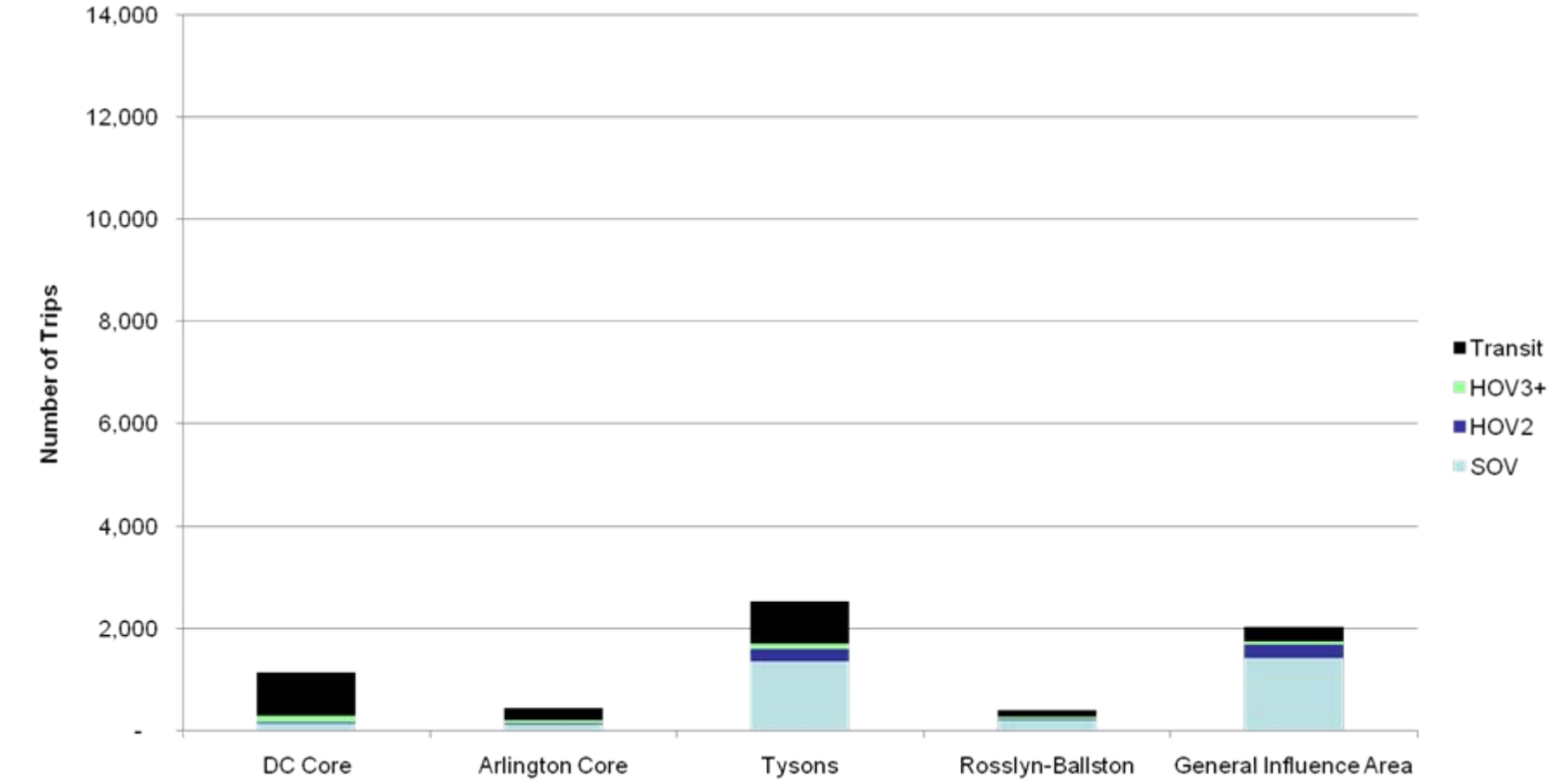

*Represent Travel Demand Forecast Model*

# Year 2030 Work Trips From the Corridor by Mode



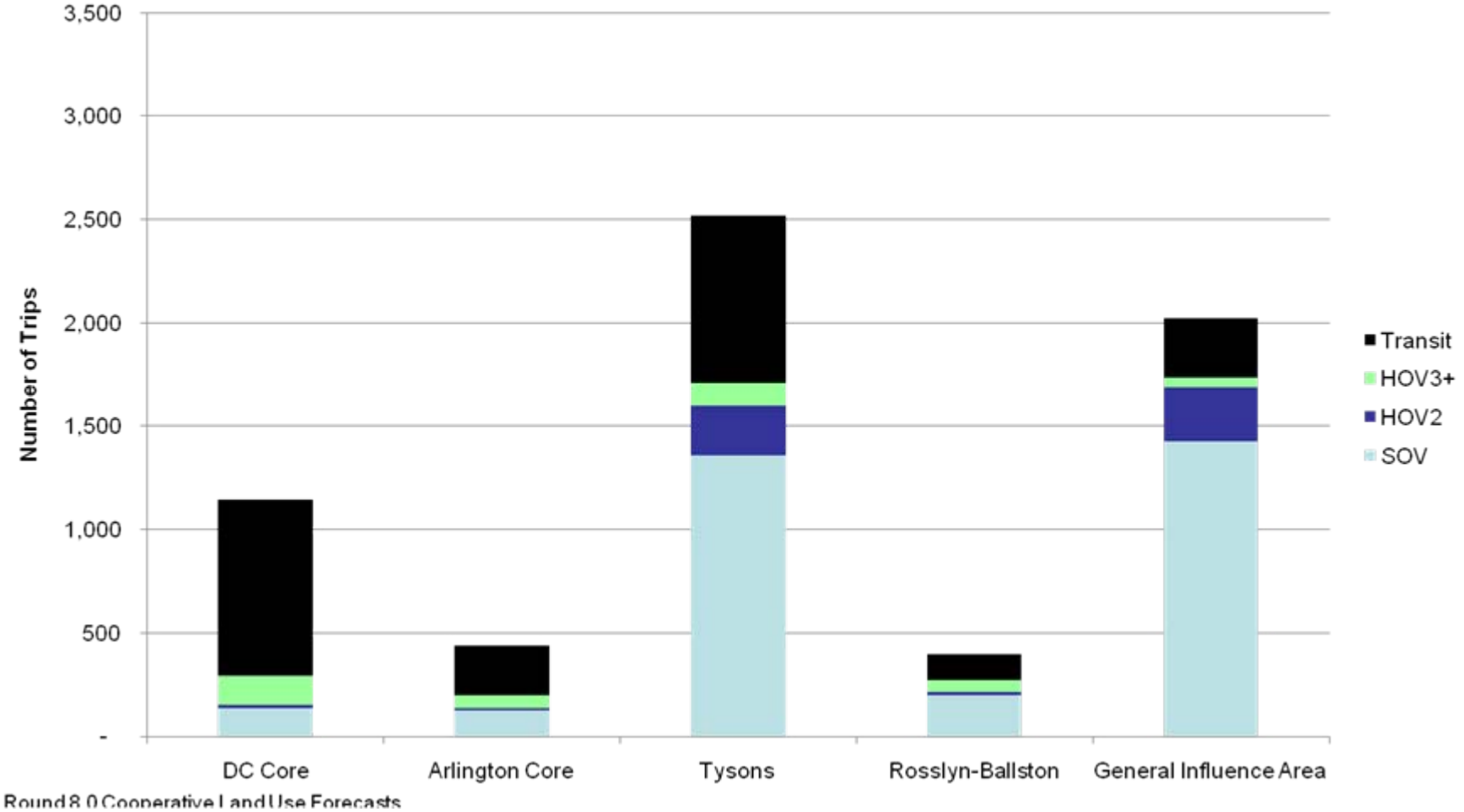

Round 8.0 Cooperative Land Use Forecasts

# Year 2030 Work Trips From the Core Area by Mode



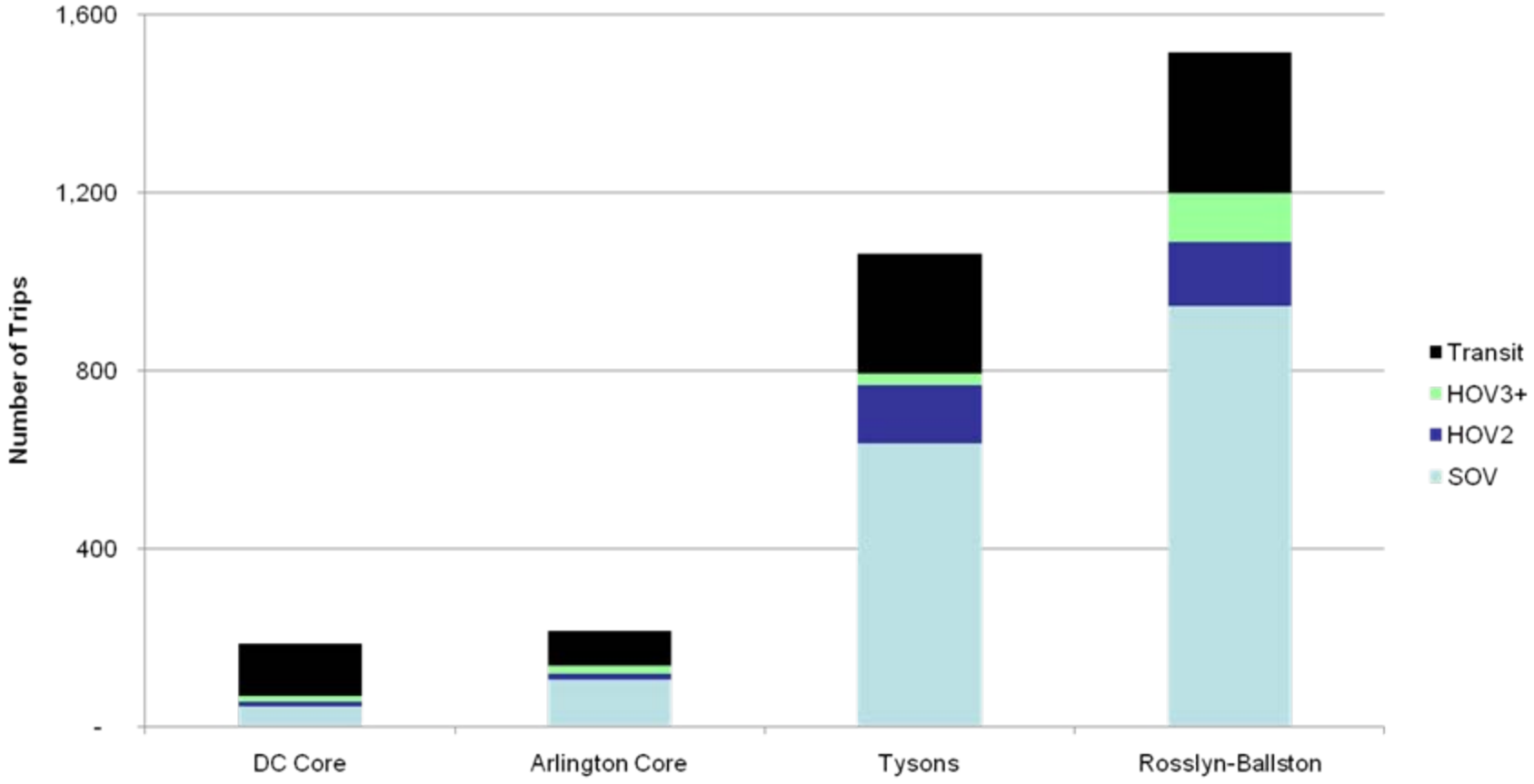

Round 8.0 Cooperative Land Use Forecasts

# Year 2030 Work Trips From the Core Area by Mode




Round 8.0 Cooperative Land Use Forecasts

# Year 2030 Work Trips to Corridor by Mode




Round 8.0 Cooperative Land Use Forecasts



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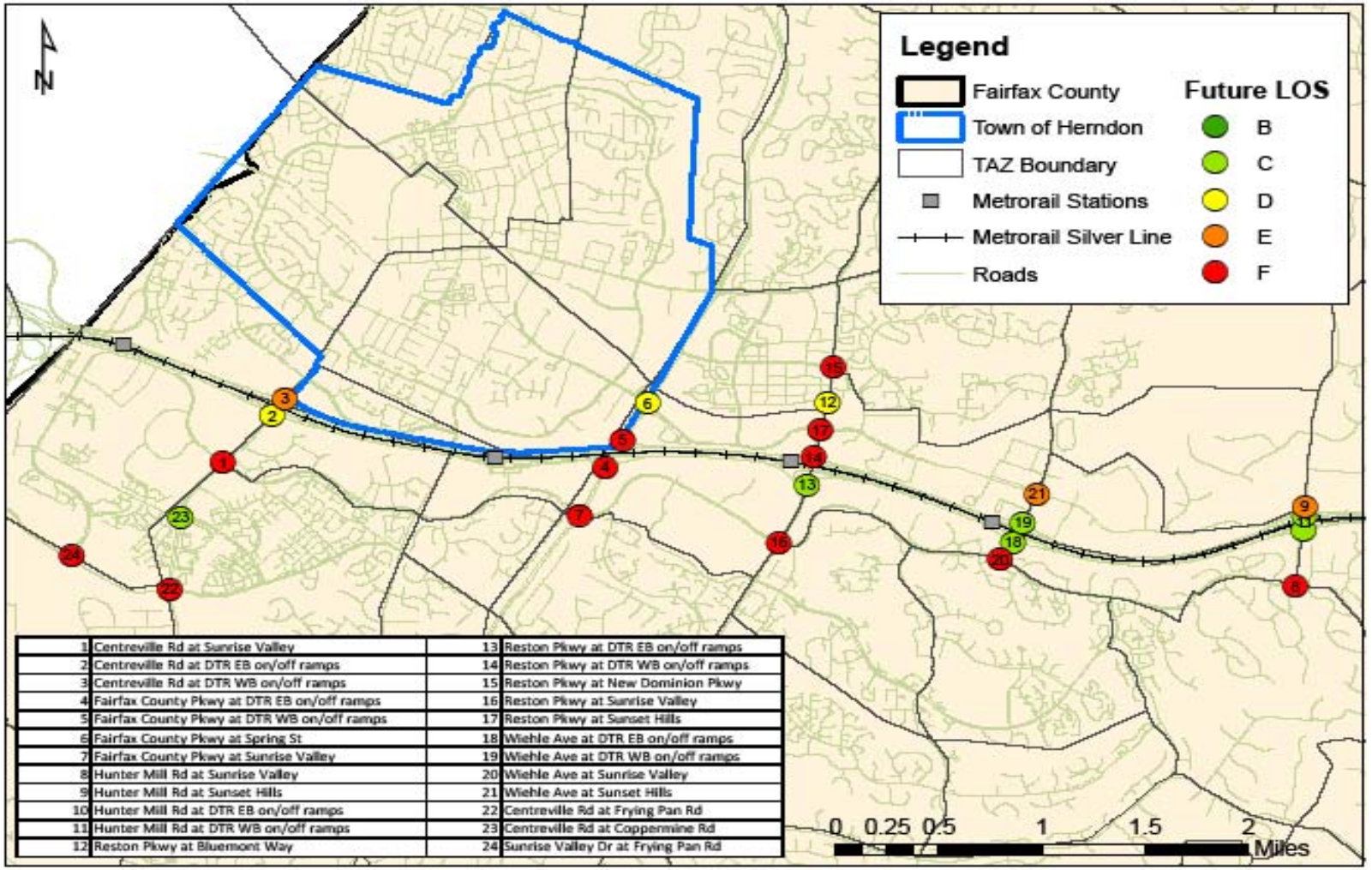
# 2030 Morning Peak Hour Level of Service (Round 8.0 Land Use)

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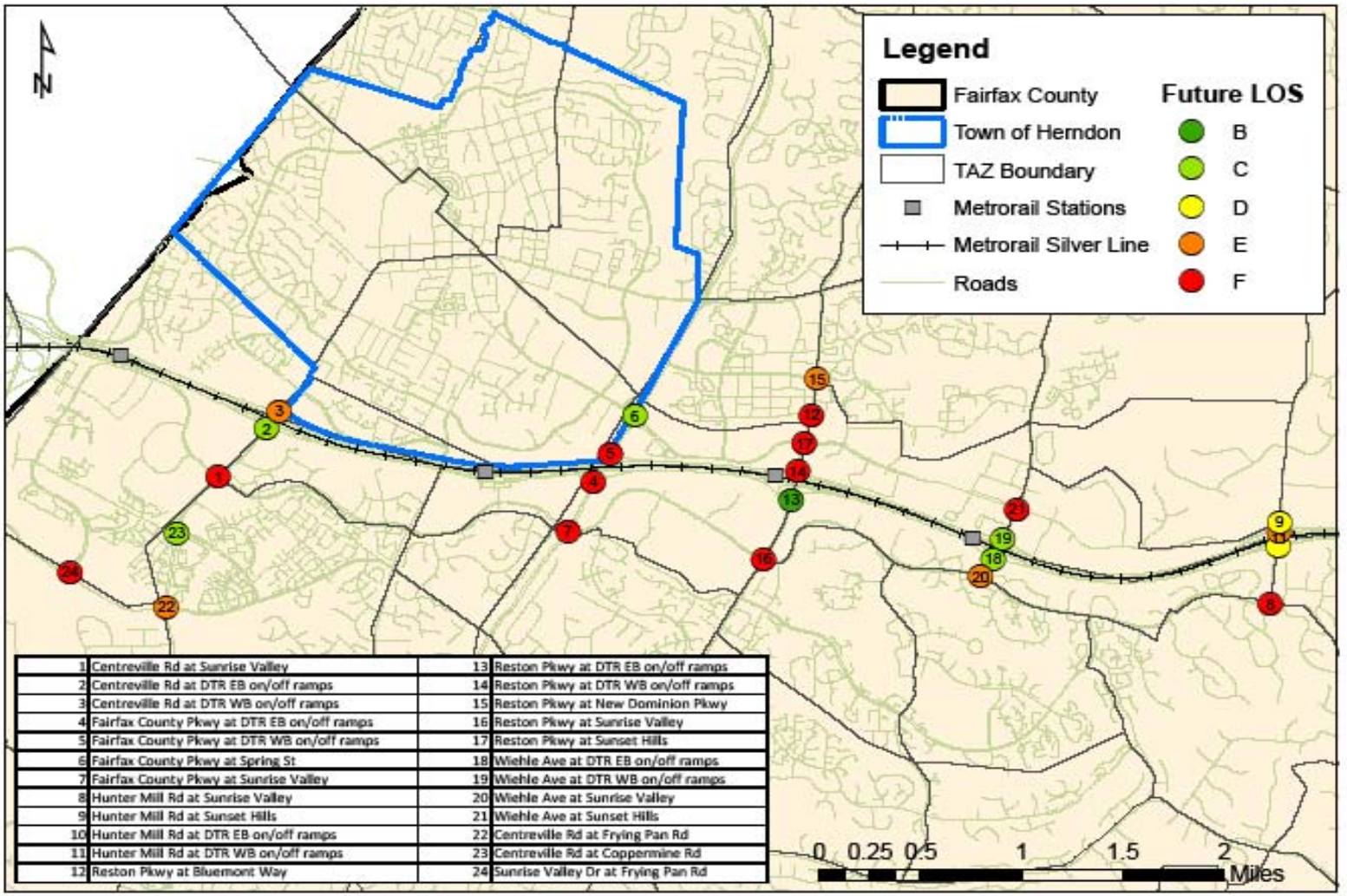
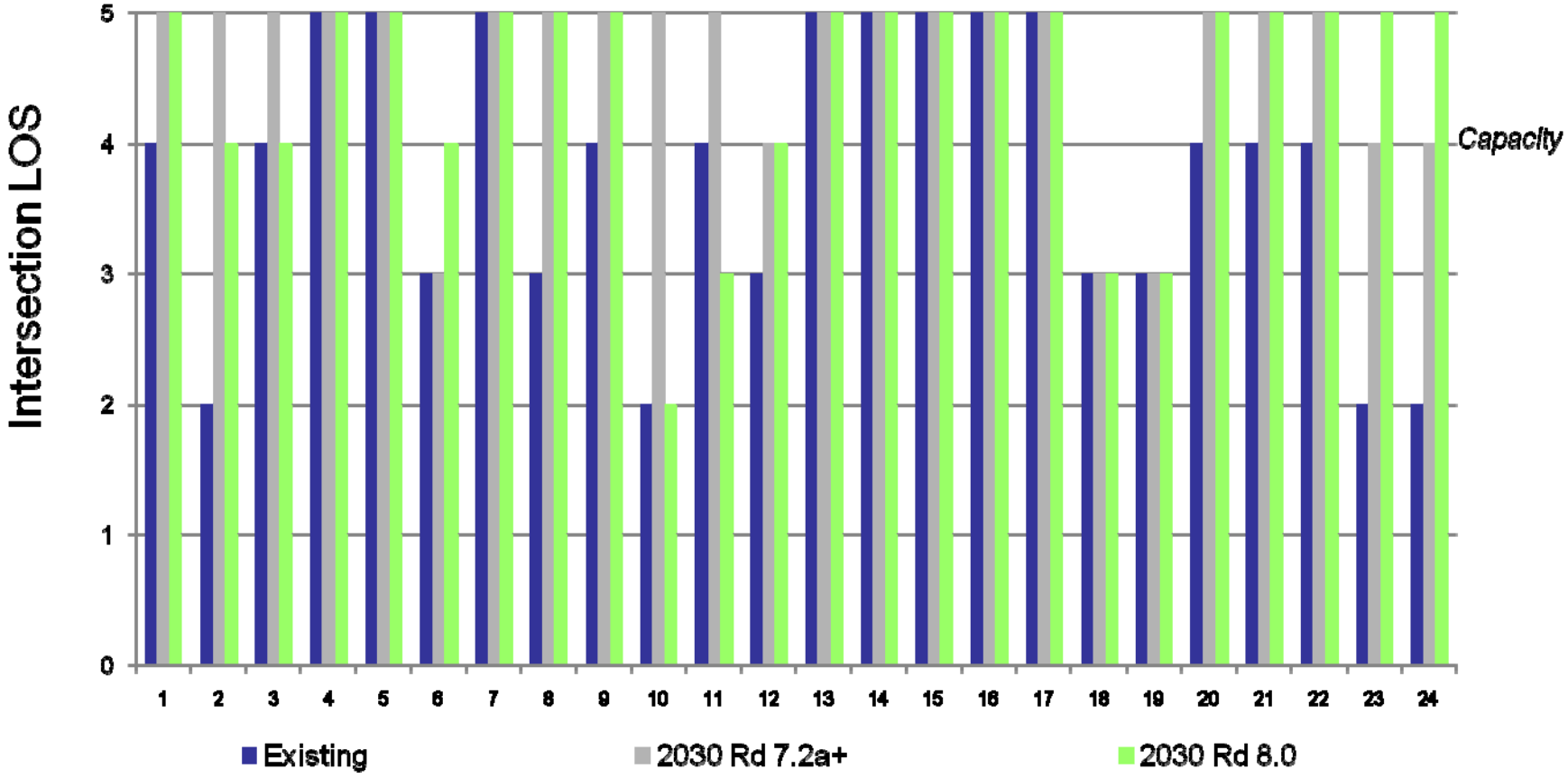
| 12 | Reston Pkwy at Bluemont Way | 24 | Sunrise Valley Dr at Frying Pan Rd |

# 2030 Evening Peak Hour Level of Service (Round 8.0 Land Use)

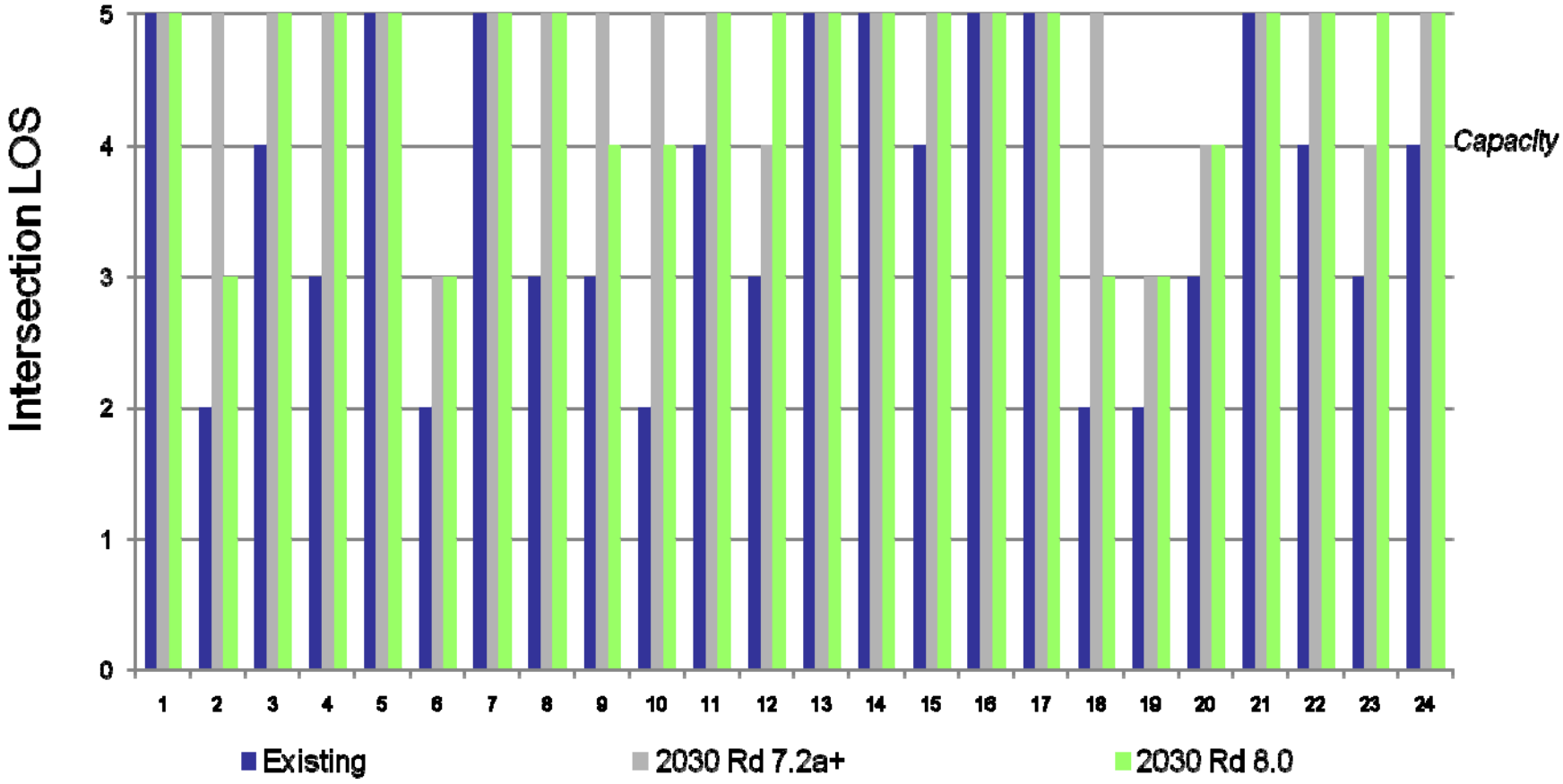



| | | | |
|---|---|---|---|
| 1 | Centreville Rd at Sunrise Valley | 13 | Reston Pkwy at DTR EB on/off ramps |
| 2 | Centreville Rd at DTR EB on/off ramps | 14 | Reston Pkwy at DTR WB on/off ramps |
| 3 | Centreville Rd at DTR WB on/off ramps | 15 | Reston Pkwy at New Dominion Pkwy |
| 4 | Fairfax County Pkwy at DTR EB on/off ramps | 16 | Reston Pkwy at Sunrise Valley |
| 5 | Fairfax County Pkwy at DTR WB on/off ramps | 17 | Reston Pkwy at Sunset Hills |
| 6 | Fairfax County Pkwy at Spring St | 18 | Wiehle Ave at DTR EB on/off ramps |
| 7 | Fairfax County Pkwy at Sunrise Valley | 19 | Wiehle Ave at DTR WB on/off ramps |
| 8 | Hunter Mill Rd at Sunrise Valley | 20 | Wiehle Ave at Sunrise Valley |
| 9 | Hunter Mill Rd at Sunset Hills | 21 | Wiehle Ave at Sunset Hills |
| 10 | Hunter Mill Rd at DTR EB on/off ramps | 22 | Centreville Rd at Frying Pan Rd |
| 11 | Hunter Mill Rd at DTR WB on/off ramps | 23 | Centreville Rd at Coppermine Rd |
| 12 | Reston Pkwy at Bluemont Way | 24 | Sunrise Valley Dr at Frying Pan Rd |

# Level of Service Comparison Morning Peak Hour



# Level of Service Comparison Evening Peak Hour



# Spot Intersection Mitigation Strategies

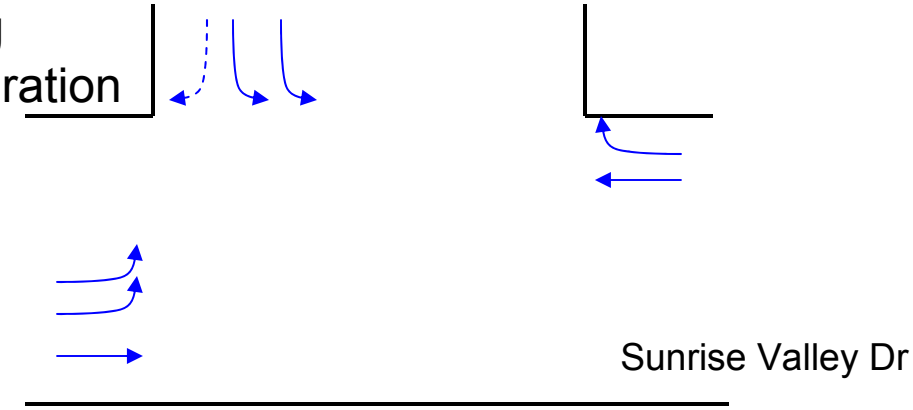
# General Mitigation Strategies

- Strategic Land Use (TOD)
  - Mixed –Use, Location, Type
- Local Connections
- Enhanced Pedestrian and Bicycle Paths
- Increase Use of Transit
- Enhanced TDM
- Traffic Operations
- Intersection Improvements

# Wiehle Ave at Sunrise Valley Dr

Future Traffic Conditions:

- Morning LOS/Delay: **F/87.2 s**
- Evening LOS/Delay: E/57.6 s



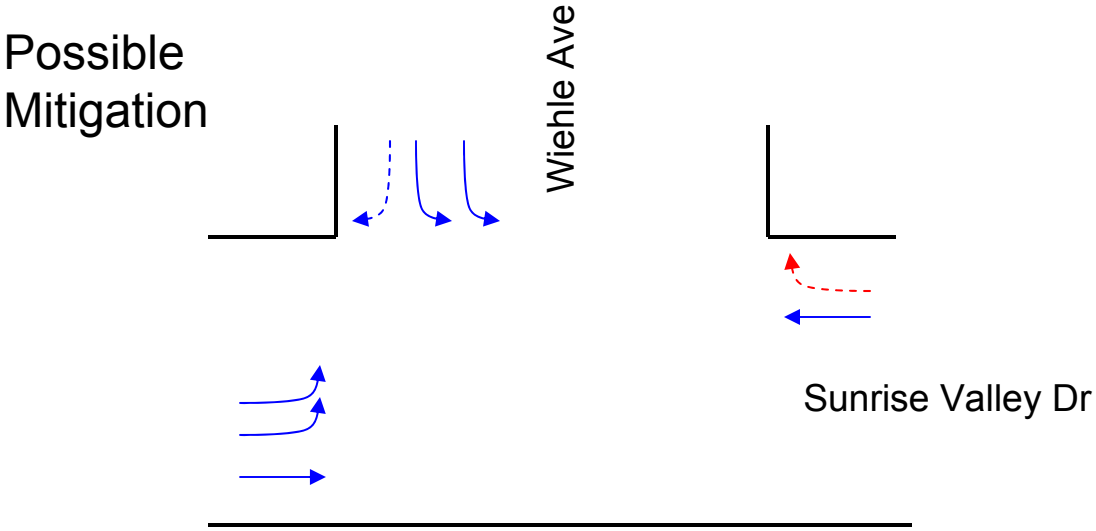

Possible Mitigation Strategies:

- Implement free WB right turns

Mitigated Conditions:

- Morning LOS/Delay: D/40.9 s (53% improvement)
- Evening LOS/Delay: D/50.5 s (12% improvement)

Additional improvement up to 5% possible with signal enhancements



# Wiehle Ave at Sunset Hills Rd

Future Traffic Conditions:

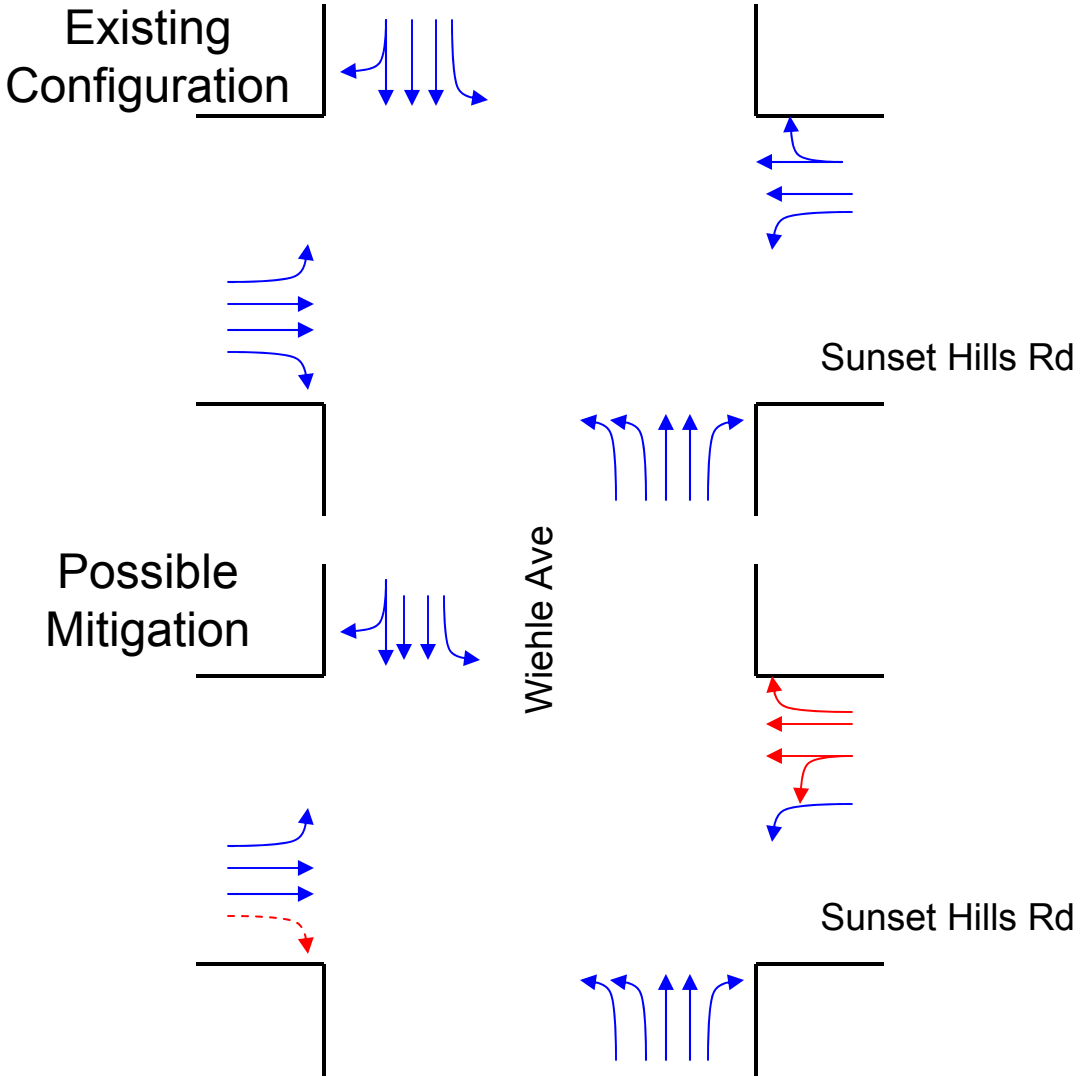
- Morning LOS/Delay: E/79.8 s
- Evening LOS/Delay: **F/183.5 s**

Possible Mitigation Strategies:

- Implement free EB right turns
- Add a WB right-turn lane
- Make WB thru/right into thru only
- Make one WB thru lane into thru/left

Mitigated Conditions:

- Morning LOS/Delay: E/74.4 s (7% improvement)
- Evening LOS/Delay: E/63.8 s (65% improvement)



# Reston Pkwy at Sunrise Valley Dr

Future Traffic Conditions:

- Morning LOS/Delay: **F/174.9 s**
- Evening LOS/Delay: **F/161 s**

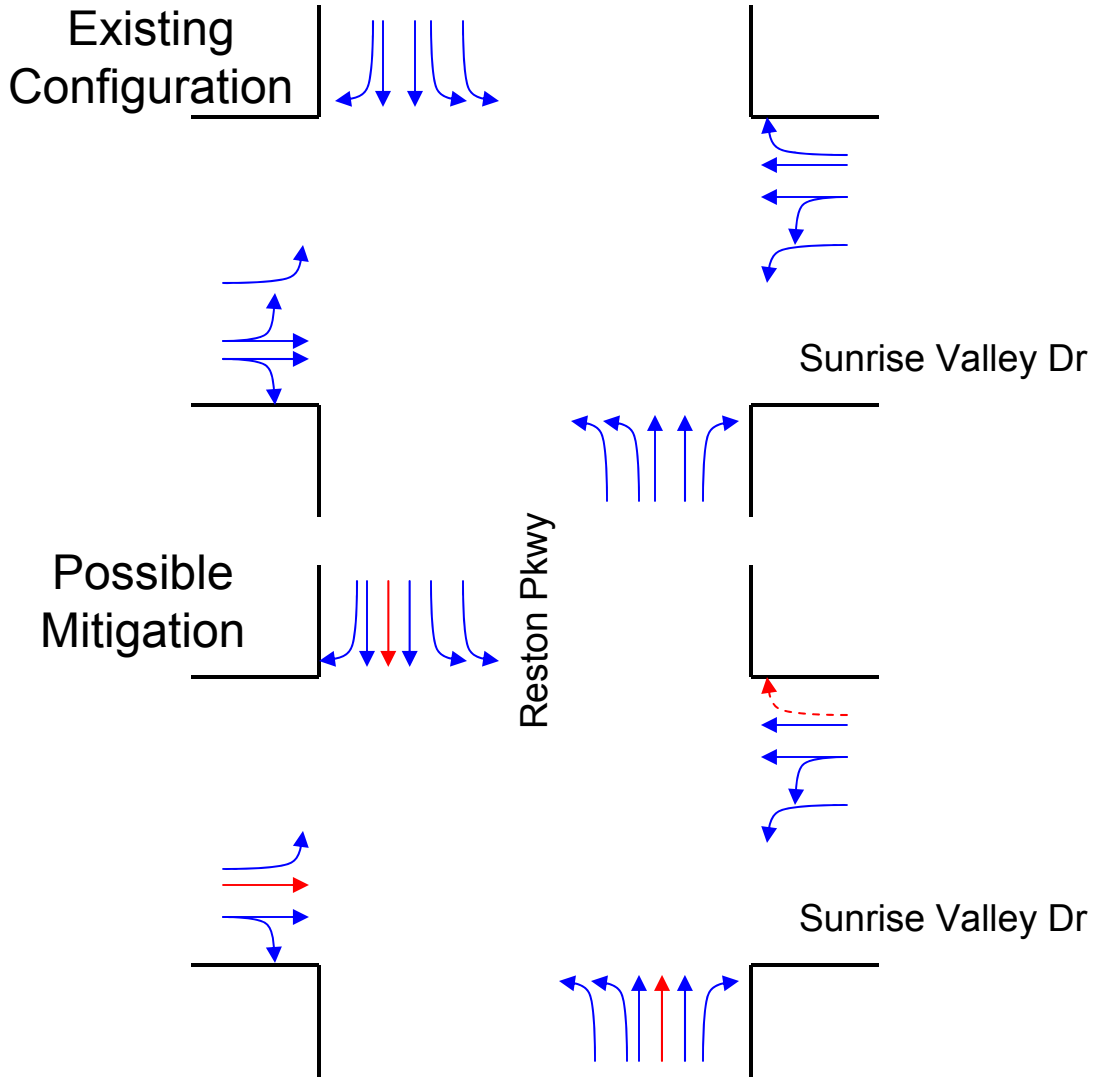
Possible Mitigation Strategies:

- Add NB thru lane
- Add SB thru lane
- Implement free WB right turns
- Restripe EB approach

Mitigated Conditions:

- Morning LOS/Delay: **F/133.9 s**
  (23% improvement)
- Evening LOS/Delay: E/79.2 s
  (51% improvement)

Additional improvement up to 28% possible with signal enhancements



# Reston Pkwy at Sunset Hills Rd

Future Traffic Conditions:

- Morning LOS/Delay: **F/146.4 s**
- Evening LOS/Delay: **F/98.3 s**

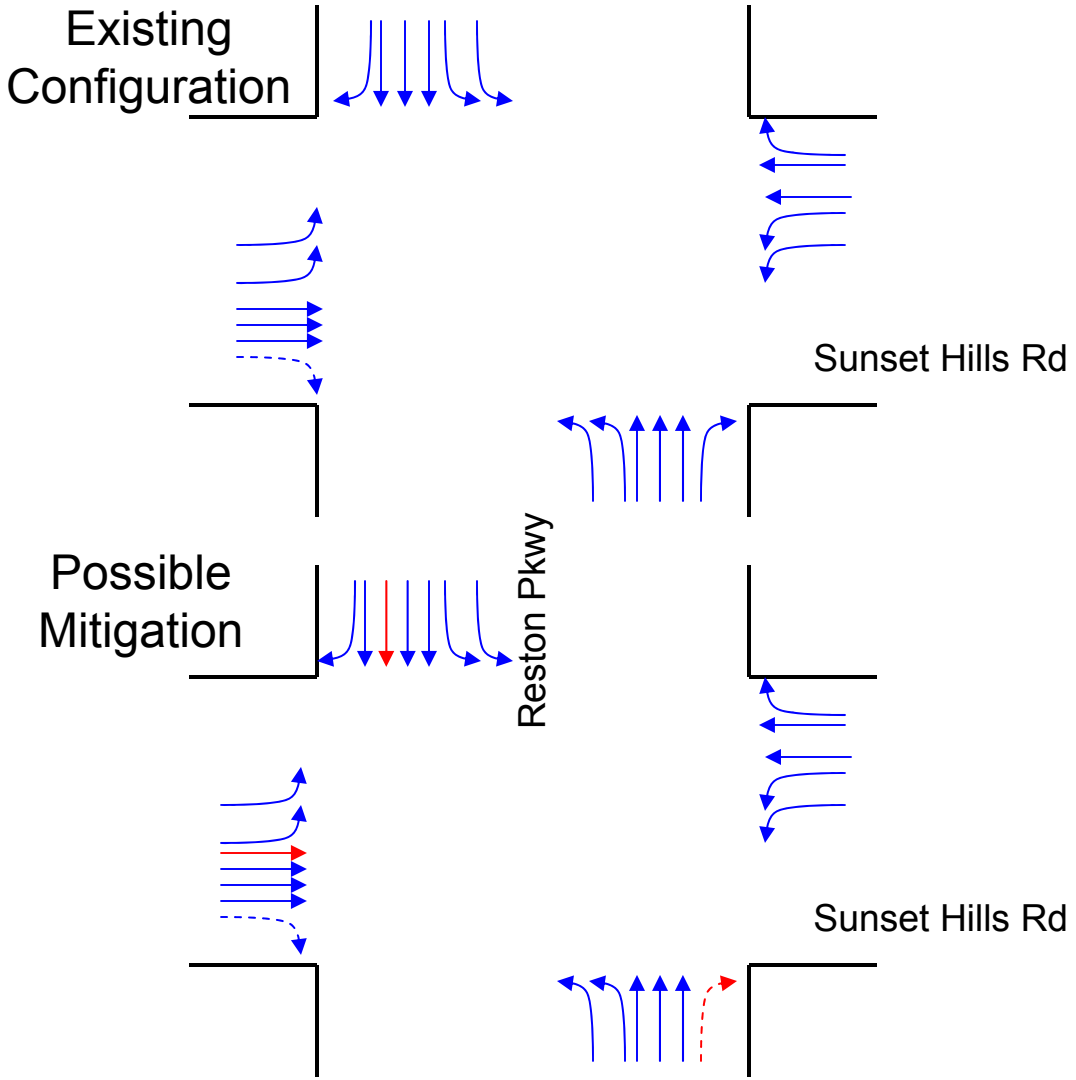
Possible Mitigation Strategies:

- Implement free NB right turns
- Add EB thru lane
- Add SB thru lane

Mitigated Conditions:

- Morning LOS/Delay: E/73.7 s (50% improvement)
- Evening LOS/Delay: E/73.8 s (25% improvement)

Additional improvement up to 9% possible with signal enhancements



# Fairfax County Parkway at Sunrise Valley Dr

Future Traffic Conditions:

- Morning LOS/Delay: **F/163.5 s**
- Evening LOS/Delay: **F/213.6 s**

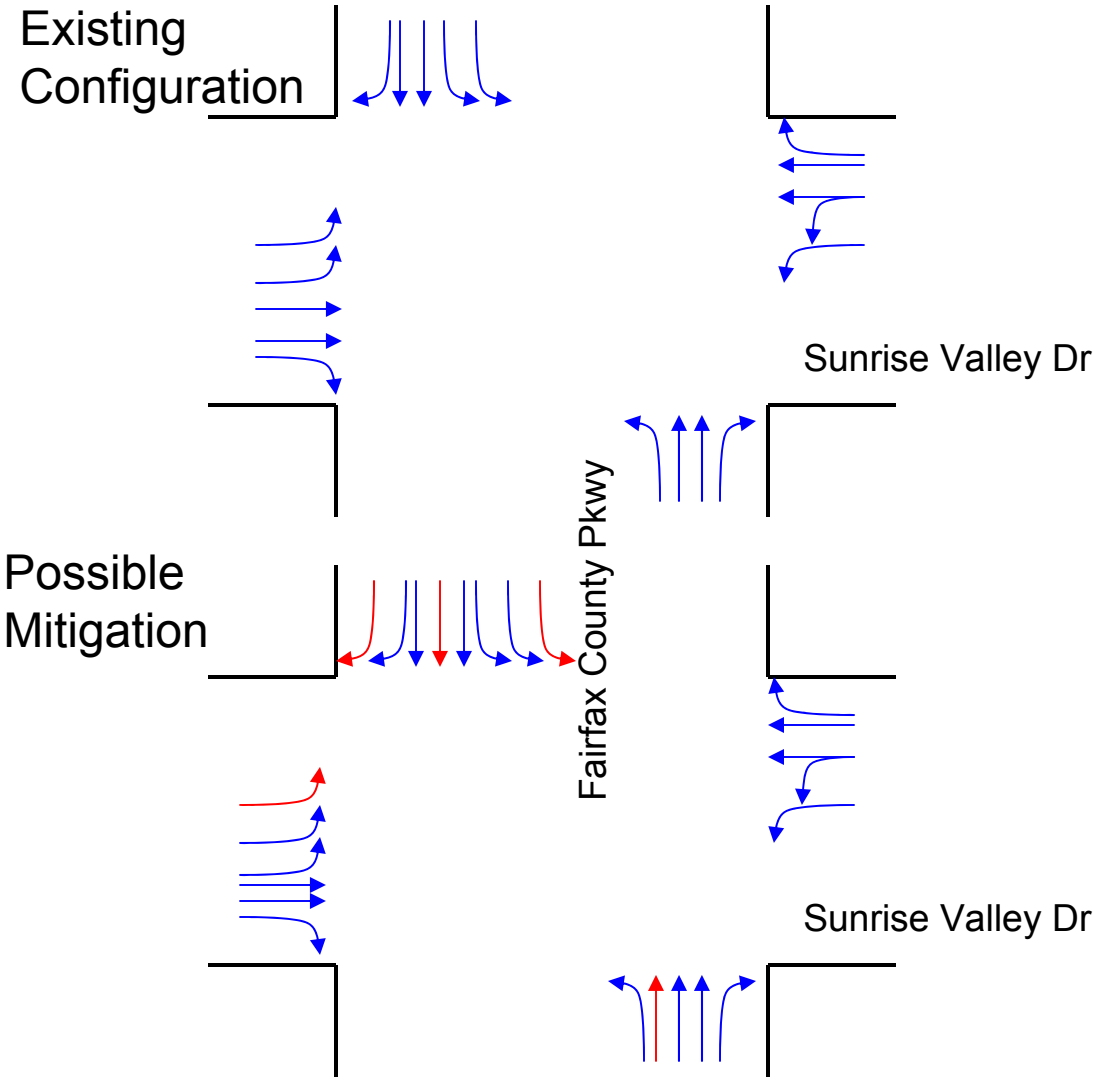
Possible Mitigation:

- Add SB right turn lane
- Add SB thru lane
- Add NB thru lane
- Add SB left turn lane
- Add EB left turn lane

Mitigated Conditions:

- Morning LOS/Delay: **F/100.5 s** (39% improvement)
- Evening LOS/Delay: **F/213.3 s** (39% improvement)

Additional improvement up to 18% possible with signal enhancements



# Fairfax County Pkwy at Sunrise Valley Dr

Future Traffic Conditions:

- Morning LOS/Delay: **F/163.5 s**
- Evening LOS/Delay: **F/213.6 s**

Previous Mitigation:

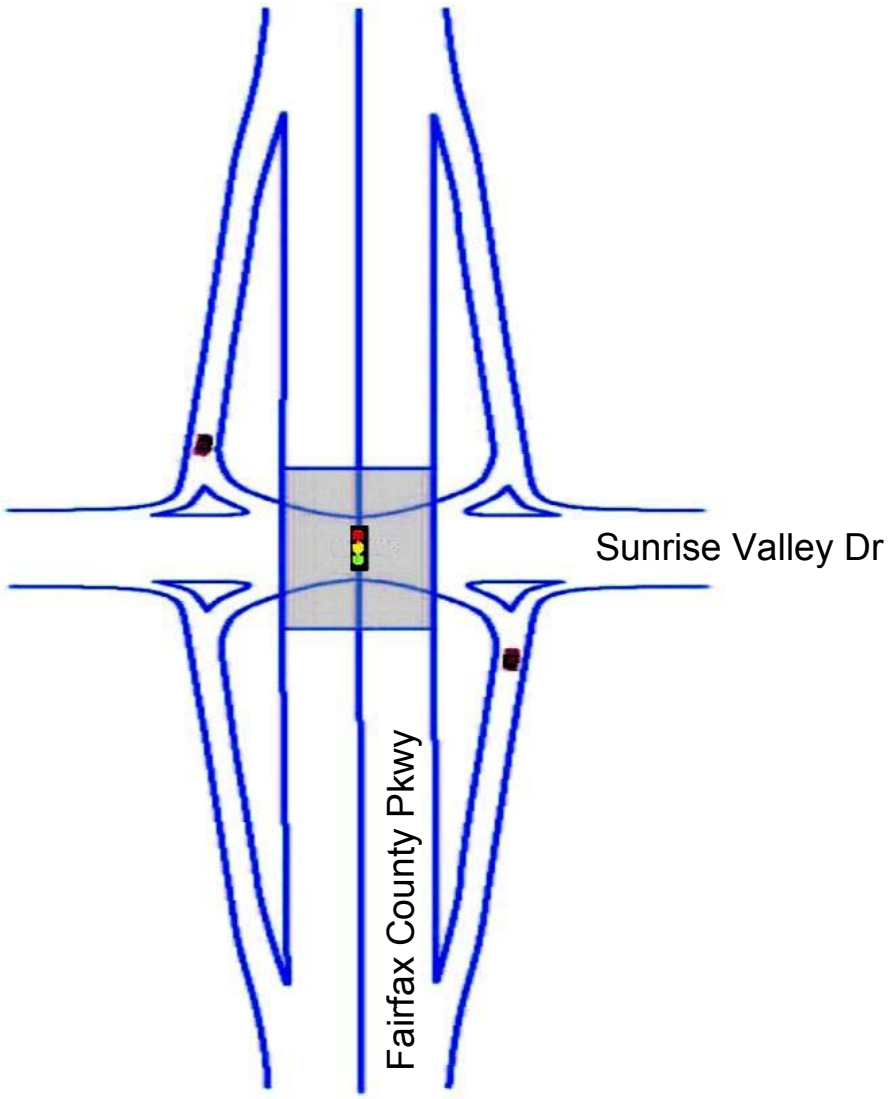
- Morning LOS/Delay: **F/100.5 s**
- Evening LOS/Delay: **F/131.3 s**

Further Possible Mitigation:

- Grade Separation with an Single Point Urban Interchange
- Implement free SB right turns

Mitigated Conditions:

- Morning LOS/Delay: E/66.2 s (60% improvement)
- Evening LOS/Delay: C/22.6 s (89% improvement)



# Strategies Moving Forward

- Strategic Land Use (TOD)
- Local Connections and Grid of Streets Analysis
- Enhanced Pedestrian and Bicycle Access
- Evaluate Potential Enhanced Transit Service and TDM
- Traffic Operations and Intersection Improvements

# Conclusion/Wrap Up

- Recap of Past Presentations – Where we left off
- Status of Transportation Analysis
- How the Model Works
- Model Results
- Mitigation Strategies

# Questions/Discussion